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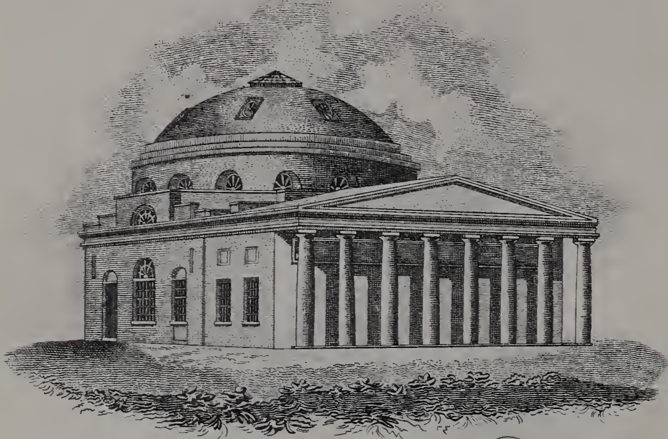

University of Maryland

Presented By

DeWitt T. Hunter Jr.

Dewitt T. Hunter

THE
POCKET CYCLOPÆDIA,

OR

EPITOME OF UNIVERSAL KNOWLEDGE:

DESIGNED FOR

SENIOR SCHOLARS IN SCHOOLS,

AND FOR

YOUNG PERSONS IN GENERAL,

CONTAINING

MULTIFARIOUS AND USEFUL INFORMATION

ON NUMEROUS SUBJECTS

NECESSARY TO BE KNOWN BY ALL PERSONS, YET NOT TO BE FOUND IN BOOKS OF GENERAL USE IN SCHOOLS.

BY JOSEPH GUY,

AUTHOR OF THE NEW BRITISH SPELLING BOOK, SCHOOL GEOGRAPHY, CHART OF GENERAL HISTORY, BRITISH READER, SCHOOL CIPHERING BOOK, ETC.

In company to discover gross ignorance of things becoming one's station in life to know, is insupportably mortifying and degrading.

ANON.

FIRST AMERICAN, FROM THE "NINTH LONDON EDITION, ENLARGED AND EXTENSIVELY IMPROVED."

BROOKFIELD, MASS.
PUBLISHED BY E. AND G. MERRIAM.
1831.

TO THE

RISING GENERATION

IN GENERAL, AND

TO THOSE WHOM HE HAS INSTRUCTED

IN PARTICULAR,

WHO ARE HIS BEST PATRONS, BECAUSE HIS
TRUEST TESTIMONIES;

TO WHOM,

AS A TUTOR,

HE HAS BEEN ATTACHED BY THE FORCE OF EARLY HABIT,
AND BY THE IRRESISTIBLE IMPULSE OF A NATURAL
INCLINATION:

FOR WHOM,

AS THE CHIEF BUSINESS OF HIS LIFE, HE HAS BEEN ACTIVELY,
AND VARIOUSLY EMPLOYED, BY HIS PUBLIC TUITION
AND HIS PRIVATE LABOURS: AND

AMONG WHOM

HE HAS SOUGHT HIS PLEASURE, HIS INTEREST,
AND HIS HONOUR,

THIS EPITOME

OF USEFUL KNOWLEDGE,

ON SUBJECTS OF WHICH NONE SHOULD REMAIN IGNORANT,

IS DEDICATED,

WITH THE SINCEREST SENTIMENTS OF ESTEEM,

AND BEST WISHES

FOR THEIR TRUEST HAPPINESS, BY

THE COMPILER.

ADVERTISEMENT.

THE NINTH Edition of any work can scarcely need an advertisement; the PUBLISHERS, nevertheless, beg leave respectfully to state that the present impression of GUY'S POCKET CYCLOPÆDIA has not only been carefully and critically revised throughout, but that considerably more than *one hundred pages* of original matter have been added to the work. In fact, nearly the whole has been re-written; and although the arrangement of *Parts*, as in former Editions, has been strictly adhered to, every Section has been, notwithstanding, materially remodelled and improved. So much, they are persuaded, is the *lucidus ordo* now apparent;—so many important articles have been added;—so much also of *recent* information on every subject, in which change or improvement has been made, is supplied; that they confidently recommend it as a work strictly corresponding to its *Title;* and one which, from the variety, interest, and universality of its contents, will not soon be surpassed by any volume of a similar size in the English or any other language.

LONDON, JUNE, 1829.

ADDRESS

TO YOUNG PERSONS.

You boast of having received a liberal education, and perhaps can tell the names of things in Latin, Greek, or French: but you must not stop here. From the knowledge of *names* you must proceed to the knowledge of *things*. A horse (says a lady, who has written excellently for young persons,) without this, will be *but* a horse to you, though you can tell me the appellation in every tongue past or present.

Among all the *manufactures and arts*, invented by man for the convenience and benefit of society, what know you of any of them beside their names? With the various *natural objects*, which present themselves hourly for our use and inspection, what acquaintance have you, except that of their form and common appearance? Know you the curious process, by which the wool of sheep is wrought up into a firm texture for our clothing? or how, and by what operations the slender tissue of a worm can be converted into silks, so rich and beautiful? how flax and cotton, the production of the earth, can receive forms so pliant, and be fabricated into vests so useful and ornamental? how, by the loom, materials can be made to assume the resemblance of figures so just, so various, and beautiful?

Do you conceive how a mass of sand, and salt, or black flint stone, can be converted into a beautiful transparent body, such as glass, and be made to minister so excellently to our use and enjoyment? or how the rough iron ore is wrested from the bowels of the earth, and made to flow like a liquid, and again hardened like an adamant? how, from its high polish, it is made to emulate the mirror? and wrought up into instruments equally various and useful?

Upon what principle, or whence can a small portion of charcoal, sulphur, and saltpetre, derive a power to shake mountains, rend rocks, or despatch ponderous instruments of instant death to hundreds, or thousands?

Know you any thing about the parts of your own body, the brain, the heart, or the nerves? to what wise purposes

each is appropriated, and how exactly all perform their functions? Have you ever observed the nice connexion of the human frame, and "how fearfully and wonderfully" we are made?

Man lives in a state of society, but the very existence of society implies laws, order, subordination, precedence; will you participate in the benefits of such society, without a desire of knowing something of that system, from which you derive domestic, social, and relative enjoyment? From the different quarters of the globe we are supplied with innumerable productions and fruits: can you partake of them without the least curiosity to inquire whence they came, or how they are produced, prepared, and preserved?

Man left to himself, and unassisted by his fellow man, is the most helpless of all animals. A hundred hands have been employed on the clothes you now wear. A thousand inventions of your predecessors are administering to your present comforts. If you inquire not into these things, wherein do you excel the lower works of creation; the tree, the shrub, or the stone, which, while arrayed in the varied beauties of nature, remain totally insensible of the sources from which they derive their nourishment?

Every object around you becomes a subject for the exercise of your talents. You are prompted to inquiries from motives of real interest, from a natural curiosity, and from the desire which you feel of possessing information and accomplishments equal to your rank in life, and that may give you a welcome reception in those circles in which you move. But knowledge is desirable even for its own sake.

By knowledge man stands preëminently distinguished amidst the creation. Knowledge is justly said to be "the solace and delight of the human mind; it is its present dignity, and its expectant consummation." By BRUTES all the beautiful varieties of nature, and all the works and ingenuity of art, are seen without intelligence, or sense of excellence or beauty. EVEN MAN, *rude and uninformed*, gazes on them, ignorant of their natures, while, by a knowledge little more than instinct, he appropriates a few of them to his wants and occasions. But of the whole creation *only man, cultivated and refined*, can view them with the eye of reason, investigate their properties and uses; and derive from them, in a more pure and exalted sense, an intellectual and social enjoyment.

PREFACE.

The utility of works like the present has been abundantly confirmed by their frequency in almost every language. Young gentlemen and ladies, after receiving what is termed a liberal or genteel education, are often found ignorant of the nature and quality of numerous objects with which they have been surrounded. To remedy this defect and to furnish them, before they leave school or at their first entrance on the busy theatre of life, with a comprehensive and regular course of digested and connected information, is the design of this Work; in drawing up which the capacities of young persons between the ages of twelve and twenty have been kept in view. A youth of twelve may, possibly, escape censure should he be ignorant of its contents; but a gentleman or lady, at or approaching their majority, would be inexcusable without some knowledge of the subjects which occur in every conversation and in every newspaper, and which have more or less connexion with almost every object that presents itself in life. *Intelligent* parents, indeed, begin with the very dawn of reason, to inform their children respecting the objects with which they are surrounded, teaching them a knowledge of things and facts, with the first knowledge of words: to such it is presumed this Work will be particularly acceptable.

And although persons of deep scientific acquirement will scarcely have recourse to these pages for information, yet as a refresher to their memories and as a compendious index to more copious sources of knowledge, this Volume will, we doubt not, be found useful.

It is presumed, therefore, that this manual will supply many of the purposes of a Dictionary of Arts and Sciences, particularly that of occasional consultation. Those conversant with small dictionaries find the definition of words and things too short and insufficient to afford satisfactory information or even, in numerous instances, to convey clear ideas.

Some of the words in a dictionary they may, indeed, never have occasion to know; and for others a short explanation is sufficient: but there are, notwithstanding, many which require more satisfactory illustration. These then, the reader will perceive, constitute many of the subjects of the present Volume: they obtrude hourly on our notice, and are either objects of utility or of laudable curiosity. Care has been taken to introduce nothing that may offend delicacy; nor any thing which may tend to warp the political or religious principles in which the young Reader may be brought up: for the design of such a Work should be not to *bias*, but *inform;* not to serve the narrow views of party, but the more enlarged purposes of general knowledge.

Of the general execution of the present Edition of the Work, it does not become the Author to speak; yet, he may be permitted to observe that the Reader will readily perceive uniformity and correct design throughout; and that *more* originality, combined with conciseness, will be found in many articles, than is generally met with in works of a similar nature. An acquaintance too with what may be called *viva voce* modern science, the science of the *Lecture Room*, and of *Literary Societies*, has imparted a feature to the Work which will not be mistaken: nothing has been stated which has not been well examined, revised, considered, and discussed.

LONDON, JUNE, 1829.

LIST OF USEFUL WORKS.

Although we have occasionally alluded to several Publications when treating of the various subjects in our Volume, the Student will, we trust, find the following *List of Useful Works to which reference may be made in a Cyclopædic Study*, of considerable assistance to him in his researches. Notwithstanding the authors mentioned have, doubtless, various degrees of merit and utility, none have been named from which either information or amusement might not be obtained. The list could be, it is true, very considerably increased; but to name all our useful writers and books would not suit our limits; we content ourselves, therefore, with noticing those which we conceive to be of most importance.

If there should be any one still incredulous as to utility and pleasures of Knowledge, we refer him to a little tract entitled, *The Objects, Advantages, and Pleasures of Science*, published under the superintendence of the *Society for the Diffusion of Useful Knowledge*. We may also mention here, to avoid repetitions, that the Society has caused to be published, at a cheap price, a variety of *Treatises on the Sciences, Biography*, &c. &c. under the title of *Library of Useful Knowledge*, which are extremely valuable, and ought to be consulted by those who desire to obtain the latest and most correct information on the subjects to which they respectively relate. Having given this general notice of the Publications alluded to, we do not deem it necessary to mention them again in the subsequent list.

It should be mentioned too, to avoid similar repetitions in regard to *Dictionaries, Lexicons*, and *Cyclopædias*, that those not exclusively devoted to one particular science are *first* named; the rest of the list is according to the order in our work.

Dictionaries, Lexicons, Cyclopædias, &c.—Crabbe's Historical Dictionary. Crabbe's Technological Dictionary. Crabbe's Dictionary of Synonyms. Todd's Johnson's Dictionary, and Chalmer's Abridgment of the same. Walker's and Enfield's Pronouncing Dictionaries. Miller's Gardener's Dictionary. Jenning's Family Cyclopædia. ~~Enc~~yclopædia Metropolitana. Mylius's School Dictionary. Guy's New British Expositor. Encyclopædia Britannica. Ree's Cyclopædia. Pantologia. Brewster's Cyclopædia. Walker's Key to the Pronunciation of Greek, Latin, and Scripture Names. Salmon's Stemmata Latinitatis. Ainsworth's Latin and English Dictionary, by Cary. Facciolati's and Forcellini's Universal Latin Lexicon, by Bailey. Schrevelius's Greek and English Lexicon. Robertson's Dictionary of Latin Phrases. Povah's Vocabulary of the Greek Roots. Levizac's French and English Dictionary, by Gros.

Nares's Glossary. Moore's Suffolk Words. Brocket's North Country Words. Jennings on the West of England Dialects. Junius. Skinner. Lye. Bayle's Dictionary. Hooper's Medical Dictionary. Jamieson's Dictionary of the Scottish Dialect. Dodsley's Annual Register.

Most of the Cyclopædias above named should be consulted for the articles mentioned in the subsequent list. Consult also the Philosophical Transactions for various subjects named below, and also the Journal of the Royal Institution; Somner and Spelman's Glossaries; and this Work generally.

Natural History of Man, Anatomy, &c.—Linnæus. Gmelin. Cuvier. Blumenbach. Haller. Cheselden. The Bells. Bichat. Fyfe. Hunter. Monro. Sir Everard Home. Gall and Spurzheim. Spallanzani.

The Mind and Passions.—Watts, Locke, Hartley. Reid. Beattie on Truth. Dugald Stewart. Dr. Brown. Dr. Haslam's Lectures. Jennings on the Nature and Operations of the Mind. Paley. Spurzheim. Crook's Manual of Phrenology. Cogan. Grove. Adam Smith.

Education, &c.—Dr. Knox, St. Pierre. Locke on the Conduct of the Understanding. Miss Edgeworth. Paley's Works. Bingley's Useful Knowledge. Analecta Latina Majora. Frey's Hebrew Grammar, by Downes. Webb's Elements of Greek Prosody and Metre. Whitehead's Grammar of the Spanish Language. Rowbotham's German Grammar. Rowbotham's and Wanostrocht's French Grammar. Wallis's, Lowth's, Priestly's, Murray's and Cobbett's English Grammars. Guy's English School Grammar. Ellis's English Exercises. Blair's Lectures on Rhetoric, the Belles Lettres, &c. Bosworth's Anglo-Saxon Grammar.

Amusements, &c.—Miss Baillie's Plays. Shakspeare. Some of Sir Walter Scott's Novels and Romances. Swiss Family Robinson. Isaac Walton's Angling. Aikin's Evenings at Home. Miss Edgeworth's Novels. Mrs. Opie's. Mackenzie's Man of Feeling. Lord Byron's Childe Harold.

Aliments: Water, Bread, Sugar, Salt, Tea. &c.—Lettsom. Willich on Diet and Regimen. Edlin's Bread Making. Fruits.—Phillips's History of Cultivated Vegetables. Transactions of the Horticultural Societies. Knight on the Apple. Brookshaw.

Wines, Liquors, &c.—Dr. Henderson on wines. Young Brewer's Monitor. Combrune on Brewing. Distiller's Guide.

Fish, Birds.—Shaw's Zoology. Pennant's. Bloch's Ichthyology. Best's and Walton's Angling. Bewick's Birds. Latham's General History of Birds. Vigors, in Linnean Transactions. Montagu's Ornithological Dictionary. Temminck's Ornithology. Illustrations of Ornithology, by Sir W. Jardine and Mr. Selby. Jennings's Ornithologia. New Edition, of Three Hundred Animals. Warterton's Wanderings in South America. Wilson's American Ornithology. White's Selborne.

Medicines.—Rennie's New Supplement to the Pharmacopœias. Pharmacopœia Londinensis and its Translations. Cullen's and Lewis's Materia Medica. Todd Thomson's and Duncan's Dispensatories. Woodville's Medical Botany. Sir Arthur Clarke on Bathing. Prout. See Hooper's Dictionary, and Todd Thomson and Brande on Mineral Waters. Black's Orfila on Poisons, and Jennings's Family Cyclopæ-

dia. Stow's Toxicological Chart. Royal Humane Society's Directions for Treatment of the Drowned. Bostock's History of Galvanism. Cornaro on a Sober life.

METALS, FIXED ALKALIES, &c. Henry's Chemistry. Thomson's First Principles of Chemistry. Berzelius on the Blow-Pipe by Children. Berzelius's Mineralogy. Journal of the Royal Institution. Faraday. Arago, Barlow, and Lecount on Magnetism.

BITUMINOUS SUBSTANCES, GEMS and OTHER STONES.—Kirwan. Hatchett. Asiatic Researches. Mawe on Diamonds. Sowerby's British Minerals. Transactions of the Geological Society. Winkleman sur l' Arte.

COLOURS and PAINTS.—Berthollet on Dyeing. Bancroft on Permanent Colours. CURIOUS WOOD, TREES, &c.—Cabinet-maker's Guide. Handmaid to the Arts. Evelyn's Sylva. Aikin's Woodland Companion. Tredgold's Carpentry. Pontey's Planter.

POLYPUS, CORAL, SPONGE.—Lamarck. Ellis on corals. Da Costa's Conchology.

WOOLEN, SILK, COTTON and FLAX MANUFACTURES.—Parry on Wool. Bath Society's Transactions. Book of Trades. Aikin's Arts of Life and Evenings at Home. Wissett on Hemp.

SKINS, LEATHER, &c.—Transactions of the Society of Arts. Segur on Tanning. HATS, &c.—The Cyclopædias.

GOLD ORES, &c.—Chaptal, Chimie appliquee aux Artes. Lewis's Philosophical commerce of the Arts. PLUMBERY, TIN, FOUNDRY, IRON, &c.—Chaptal. Lewis on the Arts. Parkes, in the Journal of the Royal Institution.

PRINTING.—Hansard's Typographia. Stower's History of Printing. Tilloch on Stereotype, in Phil. Magazine.

VARNISH, JAPANNING, &c.—Imison's Elements of Art. Cabinet of Arts. Handmaid to the Arts.

BRICKS, PIPES, POTTERY, GLASS.—Shaw's Staffordshire. Aikin's Manchester. Wedgwood, in Phil. Transact. Brogniart sur la Porcelaine.

PINS, NEEDLES.—Rudge's Gloucestershire.

BLEACHING and DYEING.—Perthollet. Des Charmes. Bancroft.

SOAP, CANDLES.—Jennings on Spermaceti, in Monthly Magazine. The Cyclopædias. PAPER.—Pliny. Maffei. Cabinet of Arts.

HERALDRY, TITLES, and DISTINCTIONS.—Dallaway, Brysdon's Heraldry. Selden's Titles of Honour. Madox's Baronia. Heylin's Help to English History.—Consult also Peerages and Baronetages.

GREAT OFFICERS OF STATE, PARLIAMENT.—De Lolme on the British Constitution. Origin, Constitution, and Practice of Parliament. Hansard's History and Debates of the same. Acherly on Parliament. Parliamentary Reports.

SOCIETY and GOVERNMENT.—Montesquieu. Grotius. Puffendorf. Vattel. Ferguson's View of Society. Paley. Gisborne's Duties of Men.

LAW, LAWYERS, JUDGE, JURY, CRIMES, PUNISHMENTS.—Blackstone's Commentaries. Law Dictionaries. William's and Burn's Justice. Dickinson's Quarter Sessions. Petersdorff's Digest of the Law Reports. The Statutes at Large. Paley's Moral Philosophy. Tidd Pratt's Collection of Statutes on the Criminal Laws passed in 1826 and 1827. Crown Circuit Companion. Gilbert's Law of Evi-

dence. Salmon and Howell's State Trials. Bentham on Legislation. Beccaria on Crimes and Punishments. Coke upon Littleton. Ward's Law of Nations. Colquhoun on the Police of the Metropolis. Reports of Criminal Trials.

Tithes, Freehold, Magna Charta, Old Terms, &c.—The Law Dictionaries. Verstegan and Brand on Antiquities, by Ellis. Nicholas's Notitia Historica. Fosbrooke's Cyclopædia of Antiquities.

Commercial Affairs, Company Bank, &c.—Rördanz' European Commerce. Anderson's and Mortimer's Commercial Dictionary. Kelly's Universal Cambist. Kelly's Book-Keeping. Sheppard's Commercial Guide and Continental Negociator. Goodacre's Book-keeping. Pope's Laws of the Customs. Beawe's Lex Mercatoria. Reeves on the Navigation Laws.

Military Affairs, the Navy Ships, Fire-arms, &c.—James's Military Dictionary and Regimental Companion. Essays on the Art of War. Robins and Hutton on Fire Arms. James's Naval History. Falconer's Marine Dictionary. Le Blond and Carnot on Fortification. Le Comte Sciences Militaires. Whitmore's System of British Tactics. Derrick's Royal Navy. Campbell's Admirals. Charnock's Marine Architecture. Sutherland's Ship Builder's Assistant. Moore on Rockets. Thompson on Gunpowder, &c. Heathcote on Stay-sails.

Language, Grammar. As the Books which relate to these subjects have been already mentioned under the preceding heads of Dictionaries, &c., and Education, the reader will have the goodness to refer to those heads for the information required; we may however add to those mentioned, Horne Tooke's Diversions of Purley. Nares's Elements of Orthoepy, and Synonymes Francois by Girard, &c. Some books, intimately connected with these subjects, are mentioned under Mythology, the Belles Lettres, &c.

Architecture.—Vitruvius. Vignola. Ware. Elmes's Lectures. Reption. Palladio. Archæologia. Britton's Cathedrals. Perrault. Elmes's Life of Sir Christopher Wren. Robinson's Antiquities of Greece. Tredgold's Carpentry.

Agriculture.—Davy's Elements of Agricultural Chemistry. Sinclair's Code of Agriculture. Dickson's Agriculture. Complete Grazier. Bath Society's Transactions. See the next Head.

Natural History, Botany, Zoology.—To the works mentioned under preceding heads we add the following:—Aikin's Natural History of the Year. Aikin's Woodland Companion. Linnæi Species Plantarum, by Willdenow, Linnæi Systema Naturæ, by Gmelin. Bingley's Introduction to Botany. Loudon's Encyclopædia of Gardening, Magazine of Natural History, and Gardener's Magazine. Transactions of the Linnean and Horticultural Societies. Zoological Journal. Smith's Introduction. Withering. Curtis. Sweet. Sowerby. Winch. Ibbetson. Koenig. Ray. Jennings's Pleasures of Ornithology. Cuvier's Natural History of the Animal Kingdom. White's Natural History of Selborne. Bevan, Huish, and Huber on Bees. Mac Leay's Horæ Entomologicæ. Samouelle on Insects. Haworth. Kirby and Spence. Sweet's British Warblers. Daine's Barrington on Singing Birds in Phil. Transact. Description of more than 300 Animals. The Zoological Gardens and Museum ought also to be visited. Pliny.

MINERALOGY, GEOLOGY, CHEMISTRY, PHARMACY.—To the Articles under Medicines and Metals we add the following: Werner. Mohs. Ure. Ure's Chemical Dictionary. Davy. Brande. Faraday. Murray. Fourcroy. Lavoiseir. Berzelius. Henry. Thomson Joyce's Dialogues on Chemistry. Thomson's Annals of Philosophy. Paris's Pharmacologia. Priestly on Air. Kirwan on Phlogiston. Transact. of Geolog. Society.

MEDICINE, SURGERY, &c.—To the Articles under Antimony, &c. we add: Hippocrates. Celsus. Hooper's Medical Dictionary. Cooper's Dictionary of Surgery. Cullen's First Lines. Brown's Elements of Medicine, by Beddoes. Hunter. Cullen's Nosology. Sauvages. Linnæus. Vogel. Sagar. Macbride. Abernethy. Darwin's Zoonomia. Medical Journals. The Lancet.

PHILOSOPHY, PHYSIOLOGY.—Bacon. Newton. Bostock's Physiology. Joyce's Letters on Natural and Experimental Philosophy. Joyce's Scientific Dialogues. Nisbet. Darwin. Smith. Knight. Ray. Vic d'Azyr. Richerand.

MENTAL PHILOSOPHY.—In addition to the authors mentioned under *mind*, we add—Aristotle. Edwards on the Will. Dr. Priestley. Berkeley. Crombie. Epictetus. Condillac. Harris. Mill.

GEOGRAPHY, ASTRONOMY, &c.—Miers's Travels in Chili. Humboldt's Travels. Ostell's New General Atlas. Holland's Ancient and Modern Geography. Bruce's Introduction to Geography. Brookes's Gazetter. Guy's School Geography. Pinkerton's and Myer's Geography. Kelly's Introduction to Spherics and Nautical Astronomy. Vince, Gregory. Bonnycastle. Ferguson. Biost. Lalande. Herschell. Guy's Astronomy. Kerrigan's Nautical Astronomy. Riddle's Navigation.

METEOROLOGY, ELECTRICITY, GALVANISM, &c.—Kirwan. Howard. Dalton. Foster. Franklin. Davy. Volta. Brande. Ure.

CHRONOLOGY, HISTORY, BIOGRAPHY.—Blair and Newton's Chronology. Picquot's Comparative Chronology. Bruce's Historical and Biographical Atlas. Bruce's Summary of Ancient History and Biography. Priestley's Chart of History and Biography. Elton's History of the Roman Emperors. Hill's Essays on the Institutions of Greece. Beloe's Herodotus. Sketches of the Domestic Manners and customs of the Romans. Plutrach's Lives. Johnson's Lives of the Poets. Watkins's Biographical Dictonary. Voltaire's Charles XII. Hume's, Smollet's, Rapin's, Henry's, Andrews's, and Lingard's History of England. Godwin's Chaucer and Commonwealth. Universal History. Rollin's Ancient History. Robertson's History of Charles V. Dodsley's Annual Register. Turner's Anglo Saxons. Warrington's History of Wales. Nicholas's Notitia Historica. Crabbe's Historical Dictionary. Baldwin's History of England, Rome, and Greece. Gibbon's Decline and fall of the Roman Empire. Moore's History of France. Camden's Britannia.

PHILOLOGY.—See MYTHOLOGY and BELLES LETTRES, &c.; and also DICTIONARIES, LEXICONS, and CYCLOPÆDIAS, and LANGUAGE and GRAMMAR above.

MATHEMATICS, ALGEBRA, GEOMETRY, &c.—Hutton and Barlow's Mathematical Dictionaries. Gregory's Mathematics. Nicholson's Algebra. Gregory's Elements of Trigonometry. Euclid's Elements of Geometry. Riddle and Kerrigan on Navigation. Guy's Arith-

metic. Huttons and Goodacre's Arithmetic. Napier. Newton. Leibnitz. Dr. H. Clarke. Gutteridge's Universal Gauger.

Optics, Perspective, Acoustics, Mechanics.—Newton. Brown's Principles of Practical Perspective. Joyce's Dialogues on the Microscope. O. Gregery. Adams. Ferguson. Millington. Partington. Brewster. Webster.

Manage and Veterinary Science.—Clater's Farrier. Clater's Cattle Doctor. White's Farriery. Coleman. Laurence on the Horse.

Politics, Political Economy, &c.—In addition to the writers named under the head Society, &c. we add—Malthus, Godwin, and Place on Population, &c. Thompson on the Distribution of Wealth. Parliamentary Reports of the Population. Smith's Wealth of Nations. Arthur Young. Sir John Sinclair. Sir W. Petty.

Fine Arts, Drawing, Painting, &c.—Craig's Lectures. Sir Joshua Reynolds. Barry. Opie. Fuseli. Landseer. Perkins. Senefelder. Clive's Short Hand. The Roman and Grecian Antiquities at the British Museum.

Instruments, Machines, &c. Air Pump.—Boyle. Hooke. Smeaton. Blow Pipe.—Berzelius, by Children. Newman. Gurney. Galvanic Apparatus.—Sir H. Davy. Gasometer.—Peckston on Gas Lights. Safety Lamp.—Sir H. Davy. Dillon. Microscope.—Joyce's Dialogues. Brewster. Kaleidoscope.—Brewster. Bradley. Pneumatic Apparatus.—Chemical Works. Pyrometer.—Daniell. Wedgwood. Smeaton. Steam Engine.—Partington. Watt. Webster. Telescope.—Herschell. Ramage. Martin. Adams. Cuthbertson. Wollaston. Troughton. Thermometer.—Leslie. Brande.

Music and Musical Instruments.—Burney's History of Music. Child's Introduction to Thorough Bass. Busby's Dictionary of Music. Crotch's Lectures.

Poetry and Poetical Terms.—The Scriptures. Homer. Anacreon. Theocritus. Pindar. Virgil. Horace. Lucan. Tibullus. Ovid. Juvenal. Terence, &c. Chaucer. Spencer. Shakespeare. Milton. Dryden. Pope. Akenside. Ossian. Burns. Byron, &c. Klopstock. Gesner. Lessing. Wieland. Dante. Petrarch. Ariosto. Tasso. Voltaire. De Lille. Racine. Boileau. Lope de Vega. Camoens. Blair's and Campbell's Lectures. Sheridan on Reading. Warton's History of English Poetry. This Work; some of the names of our most eminent Living Poets are mentioned at page 372.

Mythology, the Belles Lettres, &c.—Several Books belonging to this head are mentioned under Dictionaries, &c. Education, and Language and Grammar, as well as in the last Article; and indeed under several other heads. Baldwin's Pantheon. Lempriere's Classical Dictionary. Blair's Lectures. Campbell on Eloquence, &c. Kaim's Elements of Criticism. Alison on Taste. Burke on the Sublime and Beautiful. Rollin on the Belles Lettres. The Edingburgh, Quarterly, Wesminister, and Monthly Reviews. Retrospective Review. Monthly Magazines. Literary Gazette, &c. Sheridan on Reading.

Philosophy and Philosophers.—See under many of the preceding heads.

WONDERS of NATURE and ART.—Wonders of the World. Humboldt's Travels. Miers's Travels. Wright's Guide to the Giant's Causeway, Killarney, &c. Newell's Scenery of Wales. Grieg's World Displayed. Buckingham's Travels. Belzoni's Egyptian Antiquities. Seely's Account of Elora. Robinson's Antiquities of Greece. The British Museum. Numerous Travels in various Regions of the World. Holland's Ancient and Modern Geography.

SCHOOLS, UNIVERSITIES, INSTITUTIONS, &c.—Wood's History of the University of Oxford. Dyer's History of the University of Cambridge. Wood's Athenæ Oxonienses. Jennings on Literary Institutions. Carlisle's History of Grammar Schools. History of the Royal Society.

THEOLOGY, RELIGIOUS OFFICERS, SECTS.—The Scriptures. Paley on Christianity. Watson on the Bible. Warburton's Divine Legation of Moses. Paley's Natural Theology. Ray on the Creation. Evan's Sketch of all Religions. Evan's Golden Centenary. Mrs. Cornwallis's Observations on the Scriptures. Benson's Evidences of Christianity. Benson's Scripture Difficulties. Benson's Chronology of our Savour's Life. Waite's Sermons on the Thirty-nine Articles. Penrose on Scripture Miracles. Josephus's History of the Jews. Hind's History of Christianity. Carwithen's History of the English Church. Sale's Koran.

ANCIENT PEOPLE and COUNTRIES.—Adelung. The early Volumes of Lingard's England. Whitaker. Pinkerton. Campden.

DIVISION of TIME, CALENDER, &c.—The British Almanac. Companion to the same. Englishman's Almanac. Nelson's Fasts and Festivals. Forster's Perennial Calender. Time's Telescope.

WEIGHTS and MEASURES.—Acts of Parliament. The Cyclopædias, &c. &c.

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A

POCKET CYCLOPÆDIA;

OR,

MISCELLANY OF USEFUL KNOWLEDGE.

INTRODUCTION.

In a survey of the productions of the natural world, the globe which we inhabit, of which this work is designed to be a compendious epitome, it has been usual to consider them first as composed of original *Elements*, and then to trace the combination of those elements through an infinity of forms and bodies as dispersed throughout the *animal*, *vegetable*, and *mineral* kingdoms. For ages, the knowledge of mankind in regard to those elements, consisted in the most vague and childish opinions or guesses concerning them. Long indeed was it, after the inductive philosophy of Bacon appeared, before the true path to the knowledge of natural bodies, although pointed out by that great luminary, was successfully pursued. The *Eighteenth* century, however, and particularly the latter part of it, will for ever be an illustrious era in regard to our knowledge of the composition of numerous substances previously deemed simple, but which are now indubitably known to be compound ones. Such was the discovery of the composition of water;—the real cause of the increase of weight in what was called the *calcination* of metals,—the absorption of oxygen;—and the analysis of *atmospheric air*. Previously to this period, the elements or simple bodies in nature were commonly considered as *four;* namely, *earth*, *air*, *water*, and *fire*. Now, such has been the activity of research, and so widely has real knowledge extended, the merest schoolboy smiles at the apparently silly arrangement. So far therefore are the ultimate components of natural bodies from being only four, we now find, according to the most accurate analysis, nearly sixty different substances to which the term *element* may be applied, such substances not being capable of decomposition by any means with which we are at present acquainted. The chief of those bodies are the following: *oxygen*, *chlorine*, *iodine*, *hydrogen*, *nitrogen*, *sulphur*, *phosphorus*, *carbon*, *boron*, all the *metals*, commonly so called, and other substances now known to possess metallic properties, such are, *potassium*, *sodium*, *barium*, *calcium*, *strontium*, *magnesium*, *silicum*, *aluminum*, *yttrium*, and *glucium*.

It is an old and just observation, that the first and most important knowledge, which should claim the attention of man, is the knowledge of himself. Hence, before the young reader is led into an acquaintance with the various objects both of nature and art, which constantly present themselves in an intercourse with the world, it may be proper to open the subject with an inquiry into his own nature. The mind, indeed, before it has attained some degree of maturity, cannot be supposed to enter into a full investigation of self-knowledge; but the injunction "Know thyself" may, in one sense, be applied even to those, for whom these pages are compiled. They may be informed what are the various parts which compose the human body, animated by a mind which distinguishes man as an animal of a superior nature, and entitles him to be considered as "the lord of the creation." We shall therefore consider the divers branches of human knowledge, as, 1st. MAN, his STRUCTURE, MIND, PASSIONS, EDUCATION, PURSUITS, EXERCISES, AMUSEMENTS, ALIMENTS, MEDICINES, POISONS, DROWNING, &c. 2d. MANUFACTURES, derived from the animal, vegetable, and mineral kingdoms; 3d. CIVIL POLITY; and 4th. ARTS, SCIENCES, and LITERATURE.

PART I.

MAN; HIS STRUCTURE, MIND, PASSIONS, EDUCATION, PURSUITS, EXERCISES, AMUSEMENTS, ALIMENTS, MEDICINES, POISONS, DROWNING, HYDROPHOBIA.

MAN.—While considerable difference of opinion prevails concerning the *subvarieties* into which the human race now existing on the earth may be divided, it is nevertheless true that a few striking and obvious divisions present themselves to us on an examination of the various inhabitants of the globe. These divisions have been noticed by *Linnæus*, *Gmelin*, *Cuvier*, and others; their general outlines will be found as follow:

1st. The *white man*, consisting of almost all the inhabitants of Europe, the western temperate parts of Asia, and the northern parts of Africa. This variety is distinguished by the elegance of its form, and by a forehead more or less broad and prominent, indicative of a considerable portion of brain in the front part of the skull; the skin is however fairer, the hair and eyes lighter in colour, in the more temperate climates, than towards the south, where the skin is darker and the hair and eyes black.

2nd. The *Lapland race* has the skin of a dark colour, the visage flat, the eyes black, the body thick and extremely short. Under this head are included the Laplanders in Europe, the Samoeids, the Ostiacs, the Tschutski in Asia, and the Greenlanders and Esquimaux of America. The Finlanders also resemble these, except that they are as tall as the Europeans.

3d. The *Mongul race* has a flat forehead, small nose, prominent cheek bones, black hair, thin beard, small oblique eyes, thick lips, and a colour more or less yellow. In this division are included most of the inhabitants of Asia; the Tartars, the Monguls, the Mantcheoux, the Calmucs, the Hindoos, the Malays, the Chinese, and the inhabitants of *New Holland* and the *Polynesian Islands*. Gmelin, however,

has made these last a separate division under the head *Tawny man.* Of this division, it ought to be remarked that those who live near the equator have the skin almost black.

4th. The *Negro race* has, of course, the skin black, the hair frizzly, nose flat, and lips thick; the forehead receding, the skull indicating a considerable portion of brain behind; this variety is found throughout Africa, except its northern parts. Towards the south are two striking sub-varieties, namely, the *Hottentot* and *Caffre.*

5th. The *copper-coloured race* includes all the aboriginal inhabitants of both the Americas, except the Esquimaux. This race is said to be without beards; but this is questionable.

Of all the varieties of mankind, there can be no doubt that the *white man* exhibits the greatest marks of ingenuity and intelligence; and of this variety the most intelligent will be found those who reside in temperate climates. The *Mongul race* exhibits also considerable ingenuity, evinced particularly in the *Hindoo* and the *Chinese;* but the range of intellect of this portion of our race is nevertheless comparatively circumscribed. The *Lapland race* is, beyond question, one of the lowest orders of the human family. While the *Negro race* exhibits much animal power, it is yet far beneath the white man in intellectual capacity: we see the negro in the Hottentot at its lowest grade. The *copper-coloured man,* we may be certain, is also far beneath the European in his intellectual capacity, although he is not deficient in many fine traits of character. Some skulls of this race have been lately exhibited in London, whose portion of brain behind was enormously beyond any human skulls with which we are acquainted; of this sub-variety found in South America, it is said no memorials remain, and it is, probably, now extinct.

Upon a review of all these different conditions of mankind, a question will naturally arise, How much of the *mental* differences here observable is produced by EDUCATION?—Now, although we dare not predicate that education produces the whole of these differences, yet there is good ground for assuming that education will do more in altering and perfecting the human character, than any differences produced by climate or conformation; and hence the imperious necessity of attention to *education* in every social community.

The question, what was the *colour* of the primitive inhabitants of the world, has never been satisfactorily settled; that *climate* alters the colour of the *skins* of Europeans, we have constant evidence: even exposure to much light and sun in this country will materially alter the colour of the skin. This is strikingly exemplified in that of a delicate city lady, and a female exposed to rural labour in the fields. Bishop HEBER mentions that the Portuguese, during three hundred years' residence in India, have become as black as Caffres, although they have rarely intermarried with Hindoos. Whether, in a series of years or ages, the *muscular* and *bony* structure undergoes also a material change by a change of climate, does not appear to be satisfactorily ascertained.

HUMAN STRUCTURE.—The animal body is composed of bones, muscles, brain, nerves, arteries, veins, cartilages, membranes, glands,—also of chyle, blood, milk, &c.

BONES are white, hard, brittle, and almost insensible; they support and form the stature of the body, defend its viscera, and give power to the various muscles. The most accurate analysis of bones

gives, for their component parts, of animal matter (fat, gelatine, and albumen), 51 parts; of phosphate of lime, 37.7 parts; of carbonate of lime, 10; of phosphate of magnesia, 1.3; with occasional traces of a minute quantity of sulphate of lime. These earthy salts constitute the hardening principle of bones. In children and young persons the animal matter is more abundant in the bones; in old persons, the earthy salts: hence the bones of old persons are more readily fractured. The number of bones in the human body is generally 240; but in some individuals, who have two additional bones in each thumb and great toe, they amount to 248. The substance of bones is found to be a texture of solid fibres. With respect to the structure of this substance, it is partly compact, or solid; partly cellular, or spongy; and partly reticular, or like net-work. The solid part lies chiefly towards the outside of the bones, the spongy part towards the inside. That bones have blood-vessels and absorbents, is proved by the fine red colour which they take from the use of madder in food.

The *periosteum* is a membrane, tough and sensible, covering the whole surface of the bones. *Marrow* is a soft oleaginous or oily substance in the cavities of the bones. This fine oil is exhaled through the pores of the bones, supplying their fibres, and rendering them less apt to break.—By breaking bones into small pieces, and boiling them in water, Mr. Proust obtained their fat swimming on the surface of the liquid. The *gelatin* or *jelly* is found dissolved in the water. Hence the importance of bones in making *portable soups*, the basis of which is concrete gelatin: and likewise in making glue. The quantity of soup furnished from a given bulk of bruised or pounded bones, boiled in a vessel with a close lid, considerably exceeds that which can be extracted from the same quantity of meat.

MUSCLES are parts of the animal body destined to move some other parts, and hence are termed the organs or instruments of motion. They are composed of flesh and tendinous fibres, and contain vessels of all kinds.—With respect to the insertion and force of the muscles, it is observable, that the all-wise Author of nature has furnished animals with limbs, moveable at the joints by means of muscular cords inserted near the joint or centre of motion. The motions of the muscular parts are not owing solely to the supposed contraction of the muscles on one side, but to a relaxation also of those on the other: for when the opposite muscles act so as to counterbalance each other, the part remains in a fixed position. It is evident, that the reciprocal motion of the limbs, or their motion in opposite directions, requires the influence of opposite muscles. *Tendons* are white, firm, and tenacious parts contiguous to the muscles, and usually forming their extremities. They are connected also to the bones. They possess no apparent nerves, and very few and small blood-vessels.

FLESH is the fibrous or muscular part of the animal body: muscular flesh is composed of a great number of fibres or threads; it is commonly of a reddish or whitish colour. The ancients distinguished five different kinds of flesh; but the moderns admit one only, *fleshy* and *muscular* parts being with them the same.

SKIN is the general covering of the body. Though apparently a simple membrane, it consists of several parts. The outermost is the *scarf-skin:* it has no nerves, and is extended over every part of the true skin, except where the nails are; it is this skin which is raised

by the application of a blister; it is thickest in those parts accustomed to labour or pressure, as the hand and foot. The *rete mucosum* is a web-like mucus substance lying between the scarf and true skin, which chiefly gives the colour to the exterior of the human body. It is black in the negro; white, brown, or yellowish in the European. The *true skin* is a very sensible membrane extended over all parts of the body, and has nerves terminating so plentifully on its surface, that the finest needle cannot prick it without touching some of them. The *scarf-skin* is composed of albumen; the *true skin* chiefly of gelatin; as are also the true skins of other animals. Both the skins are extremely porous; their pores are of great importance in the animal economy.

ABSORBENTS are a set of small colourless vessels, which pervade the whole surface of the body both externally and internally. Their office is to take up whatever fluids are effused into the different cavities, and to pour out their contents for particular uses. For the purpose of absorption they are highly irritable at their extremities, and are very replete with valves to prevent the escape or return of their contents. Their number, when compared with other vessels is four times greater; and they are divided into *lymphatics* and *lacteals*, according to their respective offices, the former conveying lymph, the latter chyle.

CARTILAGES, or *gristles*, are smooth, solid, flexible, elastic parts, softer than bone, and seem to be of the same nature: some even become bones by time; some again are much softer, and partake of the nature of ligaments. They terminate those bones that form moveable joints, and in some instances serve to connect bones together. In the nose, ears, and eyelids are cartilages.

A MEMBRANE is a thin, white, flexible expanded skin, formed of several sorts of fibres interwoven together. The use of membranes is to cover and wrap up the parts of the body; to strengthen them, and save them from external injuries; to preserve the natural heat; to join one part to another; to sustain small vessels, &c.

A GLAND is an organic part of the body, destined for the secretion or alteration of some peculiar fluid, and composed of blood-vessels, nerves, and absorbents. The glands are designated either according to the particular fluids which they contain, as mucous, sebaceous, lymphatic, salival, and lachrymal glands; or their structure, as simple, compound, conglobate, and conglomerate glands. The vessels and nerves of glands always come from the neighbouring parts, and the arteries appear to possess a higher degree of irritability. Glands appear to the eye as whitish membranous masses.

The BRAIN consists of the whole of that mass which, with its surrounding membranes and vessels, fills the greater part of the skull. It is said to be larger in man, in proportion to the nerves belonging to it, than in any other animal. It consists of the *cerebrum*, *cerebellum*, *tuber annulare*, and *medulla oblongata;* the whole weighs usually about forty-eight or fifty ounces; but its weight varies in different subjects.

The CEREBRUM, which is by far the largest portion, is contained in all the upper part of the skull; it is divided into a right and left hemisphere by a membrane termed *falx*. Each hemisphere is also again subdivided into three lobes, the two lying in the front portion of the skull being the largest. It is surrounded with membranes, and accompanied with blood-vessels. Its outer substance is called *cortical*

or *cineritious*, it being of a grey colour resembling wood-ashes. The interior, called *medullary*, is of a whitish colour with a slight tinge of yellow; it is greater in quantity, more opaque, and firmer in texture, than the cineritious part. Both parts are frequently blended together so as to form streaks.

The CEREBELLUM, or *little brain*, is situated in the back part of the skull beneath the posterior lobes of the cerebrum, from which it is separated by a membrane called the *tentorium*. It is divided by the *falx minor* into two hemispheres, which are again subdivided into lobules. It consists of *cineritious* and medullary matter similar to that of the cerebrum; but the cineritious bears a greater proportion to the medullary in the former than in the latter.

The *Tuber annulare* is of a roundish form, about an inch in length and of the same width. From the tuber annulare arises the *medulla oblongata*, which forms the beginning of the spinal marrow.

From the Brain arise *nine pairs* of NERVES; some in solid cords, others in separate threads which afterwards unite into cords. Of these some have their origin in the *cerebrum*, some in the *cerebellum*, some in the *tuber annulare*, and some in the *medulla oblongata*. From these the nerves supplying the organs of *smell*, *sight*, *taste*, *hearing*, and *feeling* in part, are derived. The nerves are called pairs, not because they proceed together from the brain and spinal marrow, but because they proceed from the opposite lobes of the brain, or from opposite sides of the spinal marrow, and supply similar parts on each side of the body with nerves. And hence it often happens in paralysis, that on one side of the body all the nerves perform their office imperfectly, while on the other side no diminution of nervous energy is evinced. A nerve is a long white medullary cord. The uses of the nerves are to convey impressions to the brain, from all parts of the body, over which they are spread, and to impart motion, by exciting the muscles, to the whole system. It is the opinion of some philosophers, that the nerves contain a subtile fluid, by means of which impressions are immediately carried to the brain: this fluid has, however, never been seen: others think that sensation is produced by what has been termed vibration; but the plain truth is, we are at present ignorant of the means by which sensation and muscular motion are produced, further than that we know both are the effect of the agency of the nerves.

The SPINAL MARROW, or *medulla spinalis*, is a continuation of the *medulla oblongata* from the head through the centre of the spine, which consists of a series of bones called *vertebræ* supporting the body. From the spinal marrow are given out *thirty pairs* of nerves: these, in conjunction with those arising from the brain, communicate energy and feeling to the whole body; and also by their extreme sensibility convey to the brain, the mind, or soul, the slightest as well as the strongest impressions made upon the different organs; hence our *pleasures* and our *pains*, our *hopes*, our *fears*, and our *affections*.

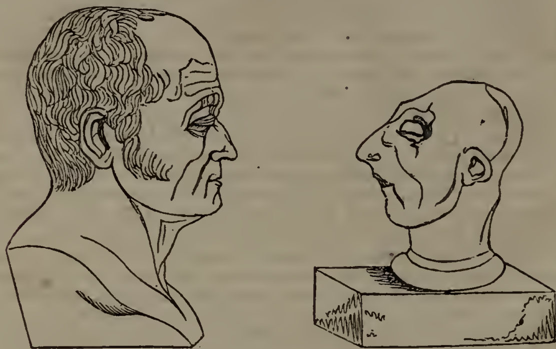
That the *Brain*, as a whole, is the organ of thought, the seat of the understanding, and the place where the emotions of the mind or soul arise, we cannot doubt; it is also the centre of *sensation* and *muscular motion*, and to which all the nerves of the body appear subservient. But to what other particular *uses* the different parts of the brain are applied, does not yet appear accurately known. The researches of

the PHRENOLOGISTS have thrown the most light on this curious, and, we must add, highly interesting subject.

It is asserted by them that the CEREBELLUM is an organ destined to communicate with, and to regulate the organs of generation. That that part of the CEREBRUM which is situated in the hinder portion of the skull, is destined to the *animal* functions; and that the front part of the same organ is occupied with the *intellectual* functions. That in proportion to the size of the brain in each of these regions, will the disposition be strong or weak for animal or intellectual action, as the case may be. The Phrenologists go however much further than this; they assert that the brain consists of *thirty-five* organs or faculties. These they divide into two kinds, namely, FEELINGS and INTELLECTS. The FEELINGS they again divide into *Propensities* and *Sentiments.* The PROPENSITIES consist of *Amativeness*, or *Physical Love;* of *Philoprogenitiveness*, or the *Love of Children;* of *Destructiveness*, or *Propensity to destroy, &c.* The SENTIMENTS consist of *Self-esteem, Love of Approbation, Cautiousness, &c.* The INTELLECTS, they say, consist also of two kinds; namely, the KNOWING FACULTIES, the REFLECTING FACULTIES. The KNOWING FACULTIES consist of a *knowledge of objects* or a *memory of facts*, of *form*, of *size*, of *weight*, of *colour*, of *space*, of *order*, of *time*, of *number*, of *tune*, of *language.* The REFLECTING FACULTIES are those of *comparison*, of *causality*, of *wit*, of *imitativeness.*

The Phrenologists, moreover, assert, that the protuberances in the skull correspond to the size of the particular organ in the brain beneath; a small faculty being an indication of small power, and a large one *vice versa.* A high and broad forehead, having of course many of the faculties much developed, is a strong indication of considerable intellectuality; a low, narrow, and receding one, the reverse. Of course the varieties are numerous, and the *exceptions*, in our judgment, not a few. That the *front* portion of the brain is that chiefly, if not exclusively, devoted to reflection and thought, we think every individual's own observation will convince him. Certain too it is, that where *much* brain is found in the skull behind the orifice of the ear, compared with the quantity in the front of the skull, that there much animal power, with less proportionate intellectual, will in general be observed. And on the contrary, where a *large* quantity of brain is found in the front part of the skull, and a *small* quantity behind the ear, there *much intellectual* power may with equal certainty be assumed. But notwithstanding this, the *quality* and *activity* of the brain, the *temperament* of the individual, and above all his *education*, must be taken into the account, in an estimation of the human character from the appearance of the skull. Whether the organs, as stated by the Phrenologists, be engaged in the functions which they have assigned to them, remains for further observation to refute or confirm. That, as far as regards the position and size of the brain, there is truth in phrenology, we think is evident; but of the particular mapping of the skull, as adopted by the Phrenologists, we think it behoves us at present to remain in modest doubt. Thus much for our young readers we deem it necessary to state: upon such a subject, we advise, in drawing conclusions, the greatest caution and circumspection. In order however to render our sketch more intelligible, we subjoin an outline of an *intellectual* and a *foolish* skull, concerning which no difficulty in deciding will, we apprehend, be found.

In justice to Drs. GALL and SPURZHEIM, we ought to state, that they have prosecuted phrenology with the greatest success; and that Mr. DEVILLE of the Strand is celebrated for his knowledge of the science, and also for taking casts of skulls.



[The outlines on the *left* are those of the skull of Dr. GALL himself, taken from a cast in the possession of Mr. DEVILLE; the outlines of the skull on the *right* are those of a naturally born IDIOT, in Holland, who was, for some time, it is said, exhibited as a native of a remote and foreign land by persons of more cupidity than honour.]

The THORAX or CHEST consists of the upper portion of the trunk of the human body; it is inclosed by the ribs, having the *sternum* or breast-bone in the front, and a portion of the bones of the back behind. It is separated from the liver, stomach, intestines, &c., by the *diaphragm*, or midriff. The thorax contains the lungs, heart, &c., and numerous blood-vessels, nerves, and absorbents. It is also separated, by a membrane called *mediastinum*, into a right and left portion.

The RESPIRATION is that action of the lungs and diaphragm consisting of the processes of inspiration and expiration, by which air is received into, and expelled from the thorax or chest. The quantity of air taken into the lungs at each natural inspiration is supposed to be about 15 or 16 cubic inches; the number of respirations made in a minute is about 20. The organs more immediately connected with respiration are the *wind-pipe*, consisting of the *larynx*, the *trachea*, the *bronchia*, and the *lungs;* and indirectly the *heart*, *arteries*, and *veins*. We shall treat of these in the order here set down, then of *air*, as one of the *pabula* of life, and next of the *blood*.

The WINDPIPE is a cartilaginous and membranous canal, through which the air passes into and from the lungs. It is divided by anatomists into three parts,—the *larynx*, the *trachea*, and the *bronchia*.

The *larynx* is a hollow cartillaginous organ at the top of the trachea. The air which passes through it during respiration produces the voice. The opening of the larynx above is called the *glottis*, over which lies a cartilage named *epiglottis*, which acts on the air issuing from the

lungs, similar to the key of a wind instrument, and also closes the passage to the lungs in the act of swallowing food, so as to prevent food or drink from entering the wind-pipe. Its concave side is next to the cavity of the larynx, while its convex surface points to the palate. This structure is most admirably adapted to produce those various tones, of which the voice is capable, and at the same time prevents the smallest particle of food or drink from entering the wind-pipe. The convulsive coughing produced by the smallest particle of fluid or solid touching the interior of this organ may convey some idea of its delicacy, and of the immediate danger of suffocation, should, by any accident, even food get into it. The larynx in men is larger than in women, generally in the proportion of two to one; hence the sexual difference of voice, which is also increased by the action of the arched palate, tongue, teeth, and lips.

The *treachea*, sometimes called *aspera arteria*, is that portion of the wind-pipe which extends from the larynx to the *bronchia*. It is a cylindrical tube, about three-fourths of an inch in diameter, and contains sixteen or eighteen cartilaginous rings. It runs along the middle of the forepart of the neck, having the large blood-vessels of the neck on each side. After entering the thorax, it separates into two branches called

The *bronchia*, one communicating with the right, and the other with the left lung, over which they are distributed by an infinite number of branches formed of cartilages, which are separated from each other like those of the trachea; they ultimately communicate with the air-cells in the lungs.

The LUNGS are two viscera situated in the thorax, by means of which we breathe. The lung in the right cavity of the chest, is divided into three, that in the left cavity into two lobes. They hang in the chest, attached at their superior part by means of the trachea, and are separated by a membrane called *mediastinum*. They are furnished with innumerable cells which are formed by a continuation of the trachea, the bronchial tubes of which communicate with each other: the whole appears not unlike a honey-comb. Their colour varies: it always inclines more or less to red, in proportion as the subject is younger; in the adult it has more of a spotted and livid cast. As the minute cells of the lungs are more or less filled with air, they impart to the lungs a peculiar spongy feel. The internal surface of the air-cells is covered with a very fine, delicate, and sensible membrane, which is continued from the larynx through the trachea and bronchia. The arteries of the lungs are the bronchial, a branch of the aorta, which carries blood to the lungs for their nourishment, and the pulmonary, which circulates the blood through the air-cells, to undergo a certain change. The pulmonary veins return the blood that has undergone this change by four trunks into the left auricle of the heart.

The most important use of the lungs is for the process of respiration, by which the circulation of the blood appears to be immediately supported; and, doubtless, by their alternate inflation and collapsing, they contribute with the diaphragm to promote the various functions of the abdominal viscera, such as digestion, &c. For the change which the blood undergoes in its passage through the lungs, see the following articles.

The HEART is a hollow, strong, muscular viscus, having the shape

of a cone or pyramid reversed. Its size varies in different subjects; it is generally about six inches long, and, at the base, four or five wide. The younger the subject, the larger is the heart, in proportion to the body. It is often smaller in tall and strong men than in others. It is situated on the left side of the thorax, and is surrounded by a membrane called *pericardium*, or *heart-purse;* it is also imbedded, as it were, in the left lung. Its weight, with the pericardium, is usually from ten to fifteen ounces. It is the centre of the circulation of the blood: of course, from it all the *arteries* arise, and in it all the *veins* terminate. It is divided internally into a right and left *ventricle;* these are divided by a fleshy *septum*. Each ventricle has two orifices; one auricular, through which the blood enters, the other arterious, through which the blood passes out. These four orifices are supplied with *valves*. There are also two cavites adhering to the base of the heart called *auricles*. The heart has, in the living subject, an alternate motion consisting of contraction and dilitation, called *systole* and *diastole*, by means of which the blood is circulated throughout the body. The blood-vessels of the heart are the aorta, (the principal *artery* of the body,) which arises from the left ventricle;—the *pulmonary artery*, which originates in the right ventricle;—the *four pulmonary veins*, which terminate in the left auricle;—the *venæ cavæ*, which evacuate themselves into the right auricle; and the *coronary arteries*, which arise from the aorta, and are distributed on the heart;—and the *coronary veins*, which return the blood into the right auricle. The nerves of the heart arise from the eighth and great intercostal pairs; but from some late experiments, the heart does not appear an organ of a very sensible kind, compared with many other parts of the body.

An ARTERY, or a pulsating blood-vessel, is a cylindrical canal conveying the blood immediately from the heart to all parts of the body for the purposes of nutrition, preservation of life, generation of heat, and the secretion of different fluids. The motion of the blood in the arteries is called the *pulse;* it corresponds with that of the heart. The pulse may be felt in various parts of the body, but the most usual place of feeling it is at the wrist. From seventy to eighty pulsations in a minute are commonly that number which in the adult subject is considered, as far as the pulse is concerned, to constitute health. In children, however, the pulse is much quicker than this; and in old persons slower. All the arteries derive their origin from the ventricles of the heart. The *pulmonary artery* from the right ventricle is distributed only through the lungs; while the *aorta*, or great artery from the left ventricle, supplies all the rest of the body with blood. The arteries terminate in small viewless veins, exhaling vessels, or anastomose with one another. Wounds in *arteries* are always dangerous, and very frequently mortal; hence the wisdom evinced in the structure of man: all the arteries are deeply imbedded in flesh, or other surrounding media, while the veins, a wound in which is comparatively unimportant, are plentifully scattered on the surface of the body. The blood in the arteries is of a florid red colour

A VEIN is a blood-vessel which returns the blood from the various parts of the body to the heart. All the veins arise from the extremities of the arteries, by a species of union termed by anatomists *anastomosis*. The blood is returned from every part of the body, except the lungs, into the right auricle of the heart; the *vena cava superior* conveys it from the head, neck, throat, and superior extremities; the

vena cava inferior from the abdomen and inferior extremities; the *coronary vein* conveys it from the coronary arteries of the heart itself. The veins do not pulsate; the blood flows through them very slowly, and is conveyed to the heart by the contractility of their coats, the pressure of the blood from the arteries, the action of the muscles, and respiration; and it is prevented from going backwards in the veins by *valves*, of which there are a great number. The blood in the veins is of a much darker red than that in the arteries.

Before we treat of the blood itself, it may be useful to the student, to know the component parts of atmospheric *air*, so essential as it is to the life of all warm blooded animals.

AIR was for many ages considered as a simple, homogeneous fluid; and it was not till towards the end of the last century that it was found to be a compound body. This point however has been long since ascertained by the discoveries of modern chemists, particularly those of ***Priestley***, ***Black***, ***Cavendish***, ***Lavoisier***, ***Fourcroy***, &c. Common air is composed chiefly of two gases, of which one, *oxygen*, forms of it 24 parts by weight, and the other, *nitrogen*, forms of it 76 parts; or about 21 parts of the former, and 79 of the latter by bulk. These proportions are found the same, in whatever part of the world the experiments are made, or from whatever height in the atmosphere the air is obtained. It ought however to be mentioned, that, besides these ingredients, common air contains a very minute portion of *carbonic acid gas;* but that portion is in general so small as not indeed to be considered of any moment. Of the two portions of atmospheric air, the *oxygen* only supports animal life or combustion. Thus, if an animal be inclosed under a bell glass containing atmospheric air, it will live in it till all the oxygen is absorbed by its breathing, and then it instantly dies; the same takes place when a lighted candle is inclosed under similar circumstances; hence the necessity and importance of this fluid to animal existence. But although only about one-fourth of atmospheric air can support life, it yet appears that such a mixture is more advantageous for animal life than oxygen alone; thus evincing the wisdom of that mixture found everywhere as atmospheric air. In what state of combination the two gases are, which constitute common air, is not exactly known; but we well know that a more intimate union of the same materials produces most powerful agents, namely, the *nitrous* and the *nitric* acids.

The BLOOD is a red fluid of a saltish taste, of a somewhat urinous smell, and glutinous consistence, which circulates in the heart, arteries, and veins, conveying nutrition, heat, and excitement to the whole body. The quantity of blood in the human body is estimated to be about twenty-eight pounds in an adult. Of this, four parts are contained in the veins, and a fifth in the arteries. When blood is drawn from the living subject, it soon concretes into a jelly-like mass, which afterwards separates into a fluid *serum*, of a pale straw colour, and a coagulated *crassamentum*, or *cruor*, which is red. The proportions of these vary; the *cruor* commonly consists of about one part, the *serum* of three. The specific gravity of blood varies in different subjects from 1050° to 1070°. The blood being returned by the *veins* of a dark red colour to the heart, it is sent from that viscus into the lungs, to undergo some material change, by coming in contact with atmospheric air in the air-cells of the lungs: after which, as has been stated, it is returned to the heart again of a much more florid colour, and then im-

pelled into the arteries, to be distributed over the body. What exact change the blood undergoes in its chemical qualities, by passing through the lungs, is not now, by philosophers, universally admitted; some thinking that the alteration of its colour is produced merely by an absorption of oxygen from the air, (of which, indeed, no one entertains a doubt,) and hence supplying to the blood a new portion of that highly stimulating ingredient. Others, and this now seems to be the most prevalent opinion, thinking that the blood is returned by the veins loaded with *carbon*, hence its darker colour, and that in the lungs the oxygen of the atmosphere combines with the carbon of the blood, and forms carbonic acid, which is carried out of the lungs by the process of expiration ; and thus the blood, losing its superabundant carbon, is restored to that florid colour which, in the arteries, it universally has. This process is called the *decarbonization of the blood ;* of which, see a further account under *Liver.* The heat of the blood is usually about 98 degrees. Besides this process of purification which the blood undergoes in passing through the lungs, it receives its immediate supply of matter, for its own production and for the general nutrition of the whole body, from the

THORACIC DUCT, an important vessel called the trunk of the absorbents. It is of a serpentine form, and about the diameter of a crow-quill. It is attached to the bones of the back, and extends from the lower opening of the *midriff* or *diaphragm* (a membrane which separates the heart and lungs from the stomach, bowels, and other abdominal viscera), to the angle formed by the union of the left subclavian and jugular veins, into which it opens and evacuates its contents, there to be mixed with the blood. These contents consist chiefly of *chyle*, a whitish or milky fluid, separated from the food by the process of digestion, and taken up by the absorbents thickly spread over the intestines, and by them conveyed to the thoracic duct.

The *serum* of the blood, besides a very large proportion of water, consists chiefly of albumen, with small portions of the muriates of potash and soda, and other neutral salts. The *crassamentum* contains, of *fibrin* and albumen together, 36 parts, and of colouring matter 64 parts in 100. The *colouring matter*, when incinerated, affords 50 parts in 100 of oxide of iron, lime 20 parts, phosphate of lime and magnesia 6, subphosphate of iron, 7 1-2, and carbonic acid and loss 16 1-2. Hence it has been inferred, that *iron* is the cause of the *red* colour of the blood ; but Mr. Brande does not think, from his own experiments, that this conclusion is warranted.

The discovery of the circulation of the blood was made by Dr. Harvey, a native of Folkstone. This discovery he taught in lectures at Cambridge about the year 1616 ; the substance of which he published in the year 1628.

Such are the offices of respiration and the blood. We shall now proceed to consider some of the most important of the abdominal viscera.

The ABDOMEN consists of all that portion of the trunk of the human body situated below the thorax. It is supported behind by the bones of the back ; below by those of the *pelvis*, which again are supported by the lower limbs. In front and at the sides, it is supported by various muscles and other soft and elastic integuments. It contains the liver, its gall-bladder, the stomach, the spleen, the pancreas, the intestines, the mesentery, the kidneys, the urinary bladder, the

omentum, &c. It has also numerous blood-vessels, nerves, and absorbents.

The LIVER, which is the largest and most ponderous viscus in the abdomen, it weighing, in adults, about three pounds, is of a deep red colour. It consists of a glandulous mass, interspersed with numerous blood-vessels. It is situated under the diaphragm, inclining to the right side of the body, having the stomach beneath it; between which and the liver itself, lies the *gall-bladder*, with which it is of course intimately connected. It is divided into two principal lobes, the right of which is by far the largest. Its shape approaches that of a circle; it is attached to the diaphragm by the suspensary and other ligaments. It is larger in young animals than in old ones. Its motions are regulated chiefly by those of the diaphragm, which are of course regulated by the respiration. The chief use of the liver was, till lately, supposed to be the secretion of *bile*, of which the gall-bladder is the receptacle: recent inquiries, however, seem to prove, that the liver not only secretes the bile, which it has been long known to do, but that it contributes very materially to the *decarbonization of the blood;* and in proof of this it has been stated, that in all animals which can remain a long time under water the lungs are small, and the liver large; and also, that the liver in the *fœtus* appears many days before the lungs. The blood is conveyed to the liver by the *vena portæ* after the manner of the arteries in other parts of the body; and after having undergone certain changes, is received again into innumerable veins which empty themselves into the *vena cava*, the common channel through which the blood returns to the heart. The French call the liver *foie*, from *foyer*, focus, or fire-place, agreeably to the doctrine of the ancients, who believed the blood to be boiled and prepared in it; which, although not correct, yet, if it effects the blood's decarbonization, as there is every probability that it does, the opinion of the ancients would appear to be not wholly devoid of truth.

The BILE is of a yellow-green colour, about the consistence of thin oil; when much agitated it froths like soap and water. Its smell is somewhat like musk; its taste is bitter. It is, in fact, a species of soap; and like other soap, is successfully employed to remove grease from clothes, &c. There are, however, two kinds of bile secreted by the liver: one, called *hepatic bile*, which flows from the liver into the duodenum, is thin, of a faint yellow colour, inodorous, and very slightly bitter; the other, *cystic bile*, which passes from the hepatic duct into the gall-bladder, and there, from stagnating, becomes thicker and more acrid. The *gall-bladder* in the human body is shaped like a pear, and is generally capable of containing about an ounce. It is firmly connected to the liver. In the elephant, stag, all insects and worms, this reservoir is wanting, the bile which they secrete passing at once into the intestinal canal. The real use of the bile does not even now seem to be accurately ascertained. It appears, however, to assist in separating the *chyle* from the *chyme*, to excite the intestines to action, and to produce the healthy appearance of the intestine evacuations. According to Thenard, 800 parts of ox-gall contained 700 water, 43 oily or resinous matter, 41 saccharine, and 4 animal substance, besides muriate, sulphate, and phosphate of soda, phosphate of lime, and oxide of iron.

The SPLEEN, or MILT, is a spongy viscus of a livid colour, in form somewhat resembling a tongue, but its shape, situation and size vary

very much. It is, in a healthy subject, always on the left side between the false ribs and the stomach. Its general length is six inches, breadth three, and one thick. It is connected, by the blood-vessels, to the stomach and the left kidney. It is larger when the stomach is empty, and smaller when compressed or evacuated by a full stomach. The uses of the spleen have, till lately, been considered as unknown; but by a paper of Sir E. HOME, in the Philosophical Transactions, it appears probable that this viscus is a reservoir for the superabundant serum, lymph, globules, soluble mucus, and colouring matter carried into the circulation immediately after digestion is completed.

The STOMACH is a large receptacle, varying in its capacity from about five to eleven pints. It is situated under the left side of the diaphragm, its left side touching the spleen, and its right covered by the thin edge of the liver; its figure nearly resembling the pouch of a bagpipe, its left end being most capacious. The upper side is concave, the lower is convex. It has two orifices, both on its upper part; the left, through which the aliment passes from the mouth through the *gullet* or *œsophagus* to the stomach, is named *cardia;* the right, through which it is conveyed out of the stomach into the *duodenum*, is named *pylorus*, where there is a circular valve which hinders the return of the aliment from the gut, but does not at all times hinder the bile from flowing into the stomach. The stomach, like the intestinal canal, is composed of three coats or membranes. Lymphatics are also distributed throughout its whole substance, which proceed immediately to the *thoracic duct*.

The uses of the stomach are to excite hunger, and, partly, thirst; to receive the food from the œsophagus, and to retain it, till, by the motion of the stomach and the admixture of various fluids, and by many other changes not exactly understood, it is rendered fit to pass the right orifice of the stomach, and afford chyle to the intestines for the nutrition of the body; or, in other words, till the important process

Of DIGESTION is completed. The chief agent in this process is, beyond question, the *gastric juice;* a fluid that is secreted from certain glands in the stomach. All that is known respecting this fluid is, that it has very energetic solvent powers in regard to a great number of animal and vegetable substances. The food being duly masticated, and blended with a considerable portion of saliva is propelled into the stomach, where it soon undergoes a remarkable change, being converted into a pulpy mass, termed *chyme:* the chyme afterwards passes from the stomach into the small intestines: here it is mixed with bile, and separated into two portions, one of which is as white as milk, and called *chyle;* the other passes on to the larger intestines, and is voided as excrementitious matter. The chyle is absorbed by the *lacteals*, which terminate in the trunk or tube called *thoracic duct;* it is there mixed with variable proportions of lymph, and, lastly, with the blood, as stated under that article.

The GASTRIC JUICE is said to be of so powerful a nature, that after death the stomach is occasionally eaten into holes by its action. And it is also said, that if exposed to a proper temperature it will digest food in metal tubes. It is said, also, that artificial gastric juice may be made by macerating fresh flesh in a solution of culinary salt.

The PANCREAS, or SWEET-BREAD, is a large gland of the salivary kind, of a long figure, compared to a dog's tongue. It lies across the upper and back part of the abdomen, under the stomach. Its

use is to secrete a juice called the pancreatic juice, which appears to be similar in its properties to saliva, and together with the bile helps to complete the digestion of the aliment. It communicates with the duodenum.

The INTESTINES consist of that convoluted tube beginning at the right orifice of the stomach called *pylorus*, and ending with the *sphincter recti.* The length of this canal is generally six times the length of the whole human subject. It is divided by nature into two parts. The *small intestines* begin from the stomach, and fill the middle or fore-part of the abdomen ; the *large intestines* occupy the sides, and both the upper and lower parts of the same cavity. The small intestines consist of the *duodenum*, so named in consequence of its length being twelve inches, the *jejunum*, and the *ileum*. The large intestines are named *cæcum*, *colon*, the largest of all, and lastly, the *rectum*, it being straight. The uses of these have been already alluded to, and need not be here repeated.

The KIDNEYS are shaped like a kidney-bean. They are situated on the lower part of the back, one on each side. They are generally surrounded with more or less fat. The absorbents which accompany the blood-vessels of the kidneys terminate in the thoracic duct. The excretory duct of each viscus is called a *ureter ;* it commences at the middle of the kidney, and conveys the urine from the kidney to the *bladder*.

The MESENTERY is a membranous viscus attached to the bones of the loins ; to it the intestines adhere. Its use is to sustain those viscera, and give them mobility and firmness ; to support and conduct with safety the blood-vessels, &c. &c. ; to fix the glands, and give an external coat to the intestines.

The OMENTUM, or CAUL, is another membranous viscus attached to the stomach, and lies on the anterior surface of the intestines. It is distinguished into the great and the little omentum. Its use is to lubricate the intestines.

MILK is thicker, whiter, and sweeter than the chyle itself, from which it is derived ; and that, probably, without much more alteration than leaving behind some of its aqueous parts. When heated to about 100°, with a little *rennet*, (which is usually made by infusing in water a portion of the salted stomach of a calf, called a *vell*), it readily separates into a *coagulum*, or curd, and a *serum*, or whey. By simple rest, a portion of its oleous part separates from its remaining constituents, and is called, in this state, *cream ;* which, by the process of churnings becomes *butter*. The curd of milk has the properties of albumen. Whey consists of *water*, *sugar of milk*, and a small quantity of saline matter. But the qualities of milk vary very much in different subjects. The uses of milk are various and important, but too well known to need enumeration.

The SENSES are those faculties or powers by which external objects are perceived. The *sight*, *touch* or feeling, *hearing*, *smell*, and *taste*, are called the *senses*. The organs through which they operate are the following :—

The EYE is the organ of *seeing*. The eye-lids, the eye-lashes, and the eye-brows, require no particular description. The eye-ball is of a globular figure ; it is composed of various membranes ; but those parts of the eye deserving the most notice, are the *iris*, the *pupil*, and the *retina*. The iris is that coloured circular ring situated beneath

the *crystalline lens*, which surrounds the central or dark part called the *pupil*. It is capable of expanding or contracting, which it constantly does, according to the quantity of light which is thrown upon the eye. In a very bright light the pupil is reduced by the contraction of the iris to a very narrow hole; in a dark place the pupil is so much enlarged, as to render the iris scarcely visible. The *pupil* is the dark round opening in the middle of the eye, surrounded by the iris, and through which the rays of light pass to the *retina*, which is the true organ of vision, and is formed by an expansion of the pulp of the optic nerve. Externally the globe of the eye and the transparent *cornea* are moistened by a fluid called the *tears*, which are secreted in the lachrymal glands, one of which is situated above each inner corner of the eye. In proportion as the eye is more or less round, is the sight of the person longer or shorter. Persons of short sight are called *myopes*, of long sight, *presbyopes*.

TOUCH, or FEELING, resides in every part of the body that is supplied with nerves. The sense of touch is most exquisite in the lips, the tops of the fingers, the tongue, and a few other places.

The EAR is the organ of *hearing*. In man it consists of an external ear, or oricula, and an internal bony cavity with numerous circular and winding passages, by which the vibrations of the air are collected and concentrated, and by a peculiar mechanism conveyed to the auditory nerves. The ear is supplied with peculiar glands, which secrete an unctuous substance, called the wax of the ear. The external auditory passage proceeds in a spiral direction to the *tympanum* or drum of the ear, which forms a complete partition between this passage and the internal cavities. Beyond the tympanum is a hemispherical cavity which leads to the *fauces*, or opening at the back of the mouth: this opening is of a trumpet form. The inner cavity, including the winding passage, is aptly called the *labyrinth* of the ear. The *sense of hearing* is perhaps still more important than that of *seeing*; but as we can have no just conception of the real state of social existence without either of these senses, it is idle to speculate on such comparisons.

The NOSE is in man, and most of the superior animals, the organ of *smelling*. The structure of the nose has nothing in it so very peculiar that can convey any idea of a mechanical organization to aid the *sense of smelling*. It is true, the nerves of the nose are considerably expanded over the nostrils, and are defended from external injuries by a peculiar mucus; but it is very difficult to ascertain what are the essential organs of smelling. The *nostrils* are two passages of the nose which communicate interiorly with the upper part of the mouth. The use of the nostrils is for smelling, respiration, and speech. The nose is an important part of the human countenance; it is considered in almost all countries as one of the features to which peculiar merit is attached.

The TASTE resides chiefly in the *tongue*, in conjunction with the palate, lips, and other parts of the mouth. The tongue is however destined to perform much more varied and important functions than that of conveying to the mind the taste of sapid bodies. It is the tongue, in conjunction with the lips, teeth, palate, and throat, which produces the sounds of *language*. The tongue is partly muscular, and partly composed of membranes and cellular substance. Its upper side is covered with *papillæ*, in which the taste more immediately

resides. The impression of sapid bodies on the organs of taste is modified by age, size, habit, and the more or less frequent application of strong stimulants. The state of the stomach, as well as general health, is often indicated by the state and colour of the tongue. In health the tongue is always of a red colour; in disease it varies from white to yellow, and sometimes is almost black. In health the tongue is always more or less moist; in disease frequently parched and dry; this last condition is, however, produced in health by the mere absence of moisture, evinced by the sensation we call *thirst.* The senses of taste and smell are nearly allied to the sense of feeling; indeed they may be considered as modifications of feeling. They are, however, properly distinguished from it, because they have each a particular organ, and are each affected by peculiar properties of bodies. The pleasures of taste are very considerable. As food is needful to the support of life, it has been happily ordered, that that becomes a source of pleasure which is necessary for self-preservation; for the pains of taste are much less numerous than those of feeling. They are only such as are necessary to prompt us to avoid excessive abstinence or gratification, and to prevent the employment of improper food; and therefore depend much more upon causes which man usually has under his own control.

The SEXES differ by obvious indications; but there are some not so universally recognized, which we may mention. The male is generally of a larger size than the female, and more robust; the male becomes frequently bald on the top of the head, the female rarely or never; the male has always more or less *beard*, the female rarely any, except as old age approaches, and then it is chiefly confined to the upper lip. The anatomical differences, besides the obvious ones, are, in the female, a larger pelvis than in the male, more delicate muscles and smaller bones; and the phrenologists say, that the female skull is more elongated than the male, from the protuberance in the middle of the back part of the skull (which they denominate *philoprogenitiveness*, or the love of children), being more prominent. The mental differences of the two sexes are also important; women appear to possess more imagination and less judgment than men; these differences are unfortunately too often widened by mistakes in the education of the female mind.

On the Mind and its Faculties.

The term MIND has been lately applied by philosophers to the *intellectual* portion of man, as being a more correct term than either *soul* or *understanding*. It implies that part of our being which is occupied in *thought*. The seat of the mind is manifestly the brain: but in what part of it, whether the whole, or in the pineal gland, as Des Cartes maintains, where he says all the nerves terminate; or whether, as Soemmering states, the fluid contained in the ventricles of the brain be its seat, is unknown: all such opinions being mere conjectures.

The mind, or soul, has been usually divided into a certain number of *faculties*. We shall consider it from its more simple to its more complex state. The commonest and simplest impression made upon the mind being conveyed to it by either of the senses, is called

SENSATION. Sensation is either pleasurable or painful; in proportion to the *degree* of pleasure or of pain produced by a sensation, will be the vividness of its apprehension by the mind. An apprehended sensation is termed PERCEPTION: that is, when the mind itself perceives, recognizes the sensation,—when it becomes the subject of thought in the mind, it is then called *perception*. An IDEA is a resemblance or image of anything, which, though not seen, is conceived, —apprehended by the mind;—an idea appears to be, therefore, nothing more than a well-defined and apprehended perception. An idea may be simple or complex, true or false. Simple ideas are those which arise in the mind from sensation; as those of colour by the eye, of sounds by the ear, heat by the touch, &c.; some ideas are formed by sensation and reflection jointly, as, pleasure, pain, power, existence. Complex ideas are infinite; some are not supposed to exist by themselves, but are considered as dependencies on, or affections of substantives, as, triangle, gratitude, murder, &c. Combinations of simple ideas are such as, a dozen, a score, beauty, theft, &c. The association of ideas, and consequently of affections, is one of the most important characters of the human mind, and the great source of our happiness or misery.

In tracing the process of the human mind in acquiring knowledge, we observe the following curious analogies or gradations; it commences with a simple idea or thought impressed, which is connected with simple perception. This solicits attention, which, according to its degrees of importance, disposes to observation, consideration, investigation, contemplation, meditation, reflection. These voluntary operations of the mind are necessary to the formation of clear conceptions, right understanding, an enlarged comprehension of some subjects, nice discernment, and accurate discriminations concerning others: these acquisitions enable us to abstract essential qualities in our minds from the subjects in which they are seated, to assemble others in new combinations, to reason, to draw inferences, and, finally, to judge or decide on their merits or defects.

MEMORY is that quality of the mind by which it is enabled to call up, generally at will, and upon suitable occasions, ideas, trains of thought which have been previously impressed upon it. No intellectual process can be carried on without memory; where the memory is weak, there the intellect will be found weak; where the memory is good, there, in general, will the intellect be powerful. In nothing, however, do individuals differ more from each other than in their memories. Some remember one kind of facts and things well, while others remember them very indifferently. This has been attributed by the phrenologists to the activity and size of particular organs in the brain; and it seems to us probable that there may be some truth in this,—indeed the phrenologists assign to the memory many organs of the brain, such as those of *form*, *size*, *weight*, *colour*, *space*, *order*, *time*, *number*, *tune*, *language*. But whatever truth there may be in this, we believe that more depends upon the *exercise* of *the mind* in any given course, than on the original conformation; that, in order to make the memory efficient, it must be often exercised on any given subject; and that the most important knowledge, if not occasionally revived by repetition, will frequently vanish from the mind. The notion of the mind being a storehouse, and that ideas once deposited there, will always there remain, is extremely fallacious. It is true they

frequently do so, especially those received in youth; but many of these, without repetition, become in time obliterated. Hence, therefore, the necessity of not only the processes of EDUCATION to improve the memory, but of an occasional repetition of them, in order that they may be efficient and useful to us in after-life.

Recollection is that part of the memory which consists in calling up in the mind the knowledge which has been previously impressed upon it. *Attention* and *repetition* help much to fix ideas in the memory; the ideas which make the most lasting impressions are those accompanied by pleasure or pain.

The powers of memory of some persons for particular subjects are astonishingly great. Seneca says that he was able, by the mere effort of his natural memory, to repeat two thousand words upon once hearing them, each in its order, though they had no connexion with each other. He also mentions that Portius Latro retained in his memory all the declamations which he had ever spoken, and never found his memory fail in a single word. Cyneas, ambassador to the Romans from king Pyrrhus, had, in one day, so well learned the names of his spectators, that on the next he saluted the whole senate and all the populace assembled, each by his name. Pliny says, Cyrus knew every soldier in his army by name, and L. Scipio all the people of Rome. Carneades would repeat any volume found in the libraries as readily as if he were reading. Many modern instances of the great powers of memory might be also adduced, but they do not appear necessary.

IMAGINATION is that particular state or disposition of the mind (by many persons called a *faculty*, by the phrenologists *ideality*), by which it is enabled to form numberless new and extraordinary ideas which are not the immediate result of external impressions or of recollection, and hence is obviously distinguished from perception and memory. By the imagination an individual creates thoughts entirely his own, and which never might have existed had they not occurred to the individual mind. The exercise of most of the other qualities of the mind requires calmness and composure. The imagination delights in the most heterogeneous and incoherent combinations and most extravagant circumstances. These visions or phantoms are nevertheless sometimes impressed upon the memory, and during imperfect or disturbed sleep present themselves and produce those absurd combinations which occur in *dreaming*. Although the flights of imagination are bold, yet they conform in some degree to the impressions which real objects have made upon the *sensorium*. And hence all the ideas which it calls up have some relation to prior received facts, and to the knowledge acquired by the mind.

Fancy, *conceits*, and *phantoms*, are merely species of which the imagination is the genus. *Poets* and *painters* are notoriously the subjects in which a powerful imagination is essential to the effectual developements of their respective arts. Poets have in all ages excited the attention of mankind; from the prophets and poets of the Hebrews to our own times. Witness the "high imaginative powers of *David* and *Isaiah*," of *Homer* and *Virgil*; of *Shakespeare*, *Milton*, *Akenside*, *Byron*, and a numerous crowd of our countrymen, heirs of immortality.

Imagination sobered by the assistance of reason, of justice, and of truth, may be made eminently beneficial to mankind.

GENIUS is, in numerous instances, allied to the imagination. It consists in that natural talent, disposition, or aptitude, which one man possesses of performing something in preference to another, with peculiar facility and excellence. Thus men are said to have a *genius* for painting, poetry, music, &c.; meaning, that the powers of their minds enable them to excel in those particular departments. The expression is derived from the ancients, who supposed themselves always attended by some good or evil genius, a spirit or demon. The oracles, domestic gods, and genii of the Greeks and Romans, have all reference to this subject, as well as the fairies, guardian spirits, &c. of the moderns. Formerly, certain individuals indulged in the most extravagant excesses merely to be considered men of genius; and even in our own times there are not wanting those who, affecting mere *eccentricity*, are too apt to imagine themselves gifted with what has been dignified with the term *genius*. Although, perhaps, minute attention to the genius of each individual is not, in a social and moral view, necessary in the education of youth, we believe, nevertheless, that some attention to this subject is absolutely necessary in order to effectuate the best developement of the character. And while we cannot avoid admiring *genius*, we ought never to forget that its best exemplification is when combined with moral, useful, and virtuous actions; that true genius, real science, and rational religion, ought to be inseparable companions.

REASON; that process or processes of the mind by which different ideas or things are compared, their fitness or unfitness perceived, and conclusions drawn from such comparisons and perceptions. *Judgment* is a similar operation of the mind; but, as its name imports, it is that act of the mind by which it concludes and determines upon certain final results. Thus we compare the sun and the moon, and finding the sun greater than the moon, we determine or judge accordingly.

The WILL is a state or disposition of the mind, consisting in being disposed, *willing*, to do or avoid any act, or to obtain or avoid any thing. The state or disposition of the mind called the *will*, is produced by innumerable agencies. Some of these arise from the internal feeling of the mind itself; others from external objects, as heat, light, cold, human society; our affections, our hopes, our fears, our pleasures and our pains; others from an association of internal feeling with external objects: and hence the incalculable varieties of human actions.

GHOST; a spirit or apparition of some deceased person. The ancients supposed every man had three different ghosts, which, after the dissolution of the body, were variously disposed of. They were distinguished into *manes*, *spiritus*, *umbra*: the manes they supposed went to the infernal regions; the *spiritus* ascended to the skies; and the *umbra* hovered about the tomb, as unwilling to quit its old connexions. The superstitious notions of ghosts, spirits, &c. are rapidly declining; and notwithstanding all the solemn tales which have been propagated, there is no reason to believe that any real spirits or celestial agents have held intercourse with man since the establishment of Christianity. The history, therefore, of modern miracles, appearances of the dead, &c. will be always found, when thoroughly examined, merely the phantoms of a disordered imagination.

In quitting this subject it may be observed, that when the mind

turns inward, *thinking* is the first operation that occurs; and in this we may observe a great variety of modifications, and whence it frames to itself distinct ideas. Thus, the perception annexed to any impression on the body by an external object is called *sensation*. When an idea occurs without the presence of the object, it is called *remembrance;* when sought for by the mind, and brought again to review this process, is called *recollection;* when the ideas are, as it were, being registered in the memory, it is *attention;* and when the mind considers any subject in a variety of views, successively dwelling upon each, it is called *study*.

KNOWLEDGE, therefore, from this short view of the mind, it will be seen, arises from those impressions and ideas which we receive by the medium of the senses. We can have no knowledge further than we have ideas. A man may be said *to know* all those truths which are lodged in his memory by a previous, clear and full perception. In intuitive knowledge the mind perceives the truth as the eye does light: thus the mind perceives that white is not black, and that three are more than two. This part of knowledge is irresistible, and on intuition depends all the certainty of our other knowledge. When the mind is obliged to discover the agreement or disagreement of our ideas by the intervention of other ideas, this is what is called *reasoning*.

Again. Knowledge includes, of course, all which we can know. It has been also divided into useful and luxurious knowledge. The best knowledge is that which enables us to act most virtuously, because virtue is the foundation of genuine happiness. *Learning*, properly so called, is not essential to a virtuous life, although considerable knowledge most undoubtedly is so: for ignorance is, in innumerable instances, the parent of error and of crime. A prudent *choice* in our pursuit of knowledge is however necessary, in order that we may avoid an idle and useless or pernicious waste of time.

The Passions.

In the proper management of the Passions consists mostly human wisdom. As every effort of the memory or imagination arouses some associate passion or affection, the mind rarely continues long in a quiescent state; that is, entirely divested of every thing sensible, and unconscious of any particular feeling. It is by observing such associate feelings, that we are enabled to ascertain the nature and operations of the passions (or suffering) of the mind, and discover three distinct modes or states of passion, which differ from simple feeling only in duration and intensity, but not in quality. The state called *passion* is violent and transitory; *emotion* is less so; and *affection* is the least violent and most permanent. Hence we distinguish between the lowest and highest degree of feeling by the terms passion, emotion, and affection, which are always employed to express the sensible effects of objects or ideas concerning them on the mind. The word *passion*, therefore, is strictly and properly used to designate the first feeling, impression, or percussion, as it were, of which the mind is conscious from some impulsive cause; by which it is wholly acted on without any efforts of its own, either to solicit or escape the impression. This passion or state of absolute passiveness, in consequence

of any sudden percussion of mind, is necessarily of short duration. The strong impression immediately produces a reaction correspondent to its nature, either to appropriate and enjoy, or avoid and repel the exciting cause. This reaction is very significantly denominated *emotion*, which is applicable to the sensible effects produced on the mind in consequence of a particular agitation. Emotions, then, although often erroneously used as synonymous with, are only the effects of passions.

The term Affection always implies a less violent, and generally more durable influence, which persons and things have on the mind. It is usually associated with ideas of good, but there exists no necessary connection. Hence we find, that the term passion is applicable to all the violent impressions made on our minds by the perception of something very striking and apparently interesting; emotion, to the external marks or visible changes produced by the force of the passion on the corporeal system; and affection, to the less violent, more deliberate, and more permanent, impressions by causes which appear sufficiently interesting. The range of affection may extend from those stronger feelings, which border upon emotions, to the mildest sensations of pleasure or displeasure, which we can possibly perceive. In like manner, the *desire* of any thing under the appearance of its goodness, suitableness, or necessity to our happiness, constitutes the passion of *love;* the desire of avoiding any thing hurtful or destructive constitutes *hatred* or *aversion;* the desire of a good which appears probable, and in our power, constitutes *hope;* but, if the good appear improbable or impossible, it constitutes *fear* or *despair*. The unexpected gratification of desire is *joy;* the desire of happiness to another under pain or suffering is *compassion;* and the desire of another's punishment, according to this hypothesis, is *revenge* or *malice*.

The desire of happiness is, then, it appears, the spring or motive of all our passions. Some wise and reasonable motive seems certainly necessary to all wise and reasonable actions. To act without a motive, would be the same as not to act at all; that is, such an action would answer no farther or better end than not acting: but whatever wise ends are intended by the passions, if they are not kept under due regulation and restraint, they soon become the sources of our misery. Authors have arranged the passions into grateful and ungrateful, primitive and derivative, &c.; but the simplest classification is into the *selfish* and the *social*, according to the exciting cause: in the former, the idea of good predominates; in the latter, that of evil. The only emotions, which cannot be considered as connected either with the selfish or social feeling, with self-love or apprehension, are *surprise*, *astonishment*, and *wonder:* these are excited by something novel, embarrassing, or vast and incomprehensible in the object, without any reference to its peculiar nature; and, exerting their influence indiscriminately in passions of the most opposite characters, are aptly denominated introductory emotions. The passions and affections founded on self-love, and excited by the idea of good, are joy, cheerfulness, mirth, contentment; pride, vanity, haughtiness, arrogance, &c.; desires inordinate, as gluttony, drunkenness, lust, &c., avarice, rapaciousness, emulation, ambition, and hope. The passions and affections operating on the principle of self-love, in which the idea of evil is immediately present to the mind, are sorrow, grief, melancholy, discontent, vexation, &c. The virtuous affections inspired by

sorrow, are patience, resignation, humility; and fear, terror, despair, remorse, cowardice, doubt, shame, &c. Fortitude, courage, intrepidity, are virtuous affections, excited only by exposure to those evils, which are usually productive of fear, to which they are diametrically opposite. To this class also belong anger, resentment, indignation, and peevishness; fortitude, courage, and intrepidity are likewise influenced by anger, with which they are always more or less blended.

The passions and affections derived from the social feeling, which extends its regards to the state, conduct, and character of others, and their relative circumstances, deportment, merit, and dispositions, as contrasted with ourselves, may be classed under the cardinal affections of love and hatred, in which the idea of good or evil is predominant. The benevolent desires and dispositions appear in the parental, filial, fraternal, conjugal, and friendly affections.

Sympathy is that inward feeling, which is excited by the situation of another, or which harmonizes with the condition and feelings of its object; in this manner it may become a passion, an affection, or a disposition. Sympathy indicates a susceptible mind, and impels men to plunge into water, or rush into flames, to succour a fellow-creature. The sympathetic affections are very numerous, and discriminated by various appellations. They may be considered as they respect distress, such as compassion, mercy, commiseration, condolence, pity, generosity, liberality, charity, and condescension: as they relate to prosperity, in the sensations of joy, gladness, happiness, &c. at the good fortune of others; and as they proceed from sympathetic imitation, or affections derived from good opinion, such as gratitude, thankfulness, admiration, esteem, respect, veneration, awe, reverence, with the deviations of fondness and partiality. The passions occasioned by displacency, in which evil is the predominant idea, are of two kinds; those in which malevolent dispositions are indicated, and those of simple disapprobation, without any mixture of malevolence. Those arising from malevolent dispositions, are hatred, envy, rancour, cruelty, &c.; anger, rage, revenge, resentment, and jealousy. The displacency occasioned by unfavourable opinions gives rise to horror, indignation, contempt, disdain, and irrision. The five grateful passions, as they have been called, of love, desire, hope, joy, and pleasing recollection, enhance each other; so do the five ungrateful ones of hatred, aversion, fear, grief, and displeasure.

As happiness and misery, virtue and vice, depend almost entirely on the proper exercise of the passions and affections, the study of their nature and influence should become a distinct and primary branch of education. *Virtue*, therefore, consists not only in an exemplary desire of regulating all our thoughts and pursuits by right principles, but also by so *acting* as to produce beneficial results to others as well as to ourselves. *Vice* is distinguished by unhappy effects, by conduct and propensities opposed to those of virtue, and consists in depraved affections and ungoverned passions. *Religion* is evinced by a laudable desire of rectitude, of yielding obedience to the divine command, and habitual solicitude to obtain the divine favour. *Devotion* is the religious temper or dispositions applied to prayers and meditations which deeply interest the affections. *Superstition* is a consecrated self-interest, without either love or regard to the supposed duties it enjoins, or to its object. He who imagines that the divine favour is to be gained by a strict attention to frivolous ceremonies is superstitious. A tena-

cious reverence for unimportant sentiments, with a censorious disposition towards those whose opinions are opposite, constitutes *bigotry.* An incessant desire to propagate some particular sentiment, or principle, to make proselytes, from whatever motive, is called *zeal.* The decided ascendancy of some particular object in the mind is denominated a *passion*, as a passion for music, &c. When this predilection occupies all our thoughts, and incites us to the most vigorous exertions with such an ardour and constancy as to brave all difficulties, it is termed *enthusiasm.* Even our motives form various species of desire, which characterize the prevailing disposition ; such as integrity, fidelity, loyalty, honesty, industry, honour, &c. ; or treachery, treason, fraud, artifice, deceit, cruelty, &c. ; according as they are influenced by worthy or unworthy dispositions. An invincible predilection to some one thing, opinion, or sentiment, extreme contempt for all other kinds of knowledge, and an obstinate opposition of private opinion as the only counterpoise to public sentiment, without any regard to the weight of evidence on either side, are the invariable features of *fanaticism.*

Education.

From the preceding sketches we shall not fail, upon a little reflection, to arrive at the conclusions, that in order that man may become a good member of society, it is necessary that he should be educated : no one becomes good or virtuous by accident : that man is the most *imitative* of all animals, and that he is so from the superior capacity and powers of his mind ; hence the facility with which he can be *educated.*

Education, in every civilized community, is of two kinds : one consists of the knowledge which is imparted in schools, universities, and other public establishments, and through the medium of books, lectures, &c. ; and the other in that knowledge, almost imperceptibly conveyed to us, which we obtain from our parents, our associates, and the usages of that part of the world in which we should happen to be born and afterwards reside. This, the first mode by which we acquire knowledge, generally makes the most lasting impression upon our minds, as the ideas first received, and their association with sensible objects are usually known to do ; and for this reason it is, that if erroneous opinions be given to us in early life, they very often remain with us during the whole period of our existence here. Hence the great responsibility and care which rest upon those, and especially parents, on whom, for many years of their lives, the chief training and instruction of children necessarily and naturally devolve.

As the end of all education ought to be the promotion of human happiness by an inculcation of orderly habits and kind offices, generally as well as individually, it is obvious that that education which most effectually contributes to these ends must be the best. It is true, in the present condition of society, labour is so much divided and sub-divided—the ranks of men are so various, that it is necessary, in order to succeed in certain objects and pursuits, that the mind should be specially disciplined for them respectively. Thus a different education becomes necessary to fit a person for divinity, law, or physic, &c. ; but in all these, the *liberal* professions,

as they are termed, a knowledge of the learned languages, *Greek* and *Latin*, and for the divine, *Hebrew* is considered an essential pre-requisite. There can be no doubt that such *Learning* is extremely useful to these individual professions; but we must be careful nevertheless, even in these, not to mistake the means for the end. A knowledge too of some of the modern languages will be found also to have its uses, particularly that of *Italian*, *German*, and *French*. This last language, indeed, from our intimate association with the French people, has now become an almost essential ingredient in all liberal education. It is a very easy language, and may, at any time, be very soon acquired with the assistance of an adroit teacher.

For by far the greater portion of mankind, however, a knowledge of the learned languages, and even of French, is comparatively unimportant; while we are certain that a knowledge of our own language, (and every Englishman ought to be intimately acquainted with his own language,) and of the various facts with which, fortunately for us, our books written in English are stored, will contribute more essentially and effectually to our instruction and our happiness than all the writings of the ancients without them.

Of the learned languages, as well indeed as the modern tongues, we may just observe, that the modes formerly adopted in our schools, and by our teachers for their acquisition, have been any thing but inviting. The memory has been exercised too much, the judgment too little. New methods of teaching them have been lately introduced, which promise to effectuate the objects in much less time, with more credit to the teacher, and with much more pleasure to the pupil.

The PURSUITS of mankind are almost as various as our various tastes and inclinations; it is nevertheless indisputably true, that the best, the most useful pursuits, are those which produce the most lasting benefit to the individual, and which, at the same time, contribute to, or at least do not contravene the general well-being of society. Whatever might be said of the irksomeness of toil, there can be no question that he who is constantly and necessarily engaged in some active and useful pursuit, is much more happy than one who is enabled to choose his employment, and be idle if he likes. Inactivity is not a state from which the mind can derive much acute or agreeable enjoyment; we require to be excited, impelled; and the alternations of activity and repose increase our capacities for pleasurable sensation. He, therefore, who is not forced by his wants to adopt some pursuit by means of which they may be gratified, is more likely to be unhappy than he who rises to daily toil, but who retires at night to sound sleep and undisturbed repose. One of the greatest afflictions which can beset us here is, to have nothing to do—no object of pursuit.

To obviate therefore the inconveniences attendant upon an inactive life, whether arising from absolute want of employment or from sedentary occupation,

GYMNASTIC EXERCISES have been proposed; and indeed latterly several societies of gymnastics have been established in this metropolis, where morning and evening various methods of exercising the body have been adopted, which appear well calculated to promote the general health, and produce that elasticity of muscle and energy of mind, which sloth and sedentary employment very often destroy.

Those who have devoted themselves to such exercises express themselves in the highest terms concerning the benefit derived from them; and we think there can be no doubt that, for the citizen in particular, they will be found eminently beneficial.

Other exercises may also be mentioned which have, on suitable occasions, a salutary effect upon the health; such are those of *riding*, *walking*, *rowing*, *swimming*, &c. Of these we believe rowing to be one of the best. *Wrestling*, *boxing*, and *fencing*, whatever may be their utility in exciting the muscles, we cannot recommend, as they lead to a kind of contention which is much better avoided.

OF SWIMMING we think it necessary to say a few words. The art of swimming should be learnt by every male subject who is not naturally incapacitated from performing it, as it is impossible to foresee what conjunctures and accidents may occur, to render such an art of the utmost importance to our fellow-creatures. Persons who are learning to swim should *never go out of their depth :* for one of the greatest obstructions to the acquisition of the art is fear. The learner ought first to walk courageously into the water, till the fluid reaches to his breast, when he must gently incline his belly towards the surface, the head and neck being erect ; next, the legs must be withdrawn from the bottom while they are extended or stretched out; and the arms should be stricken forward corresponding with the motion of the feet. The motion of a frog in the water is very nearly the motion which a person learning to swim should imitate. Swimming *on the back* is not essentially different from the method just described; but, except for greater expedition, there is no necessity of using the arms at all ; the progressive motion of the body being readily produced by the legs alone. In *diving*, the swimmer must close his hands together, and bending his head close to his breast, his feet must be exerted with force ; when he wishes to ascend, he has nothing more to do than to relax all the muscles, become motionless, and he will soon rise to the surface of the water. It is of importance to know, that *fresh* water is usually somewhat heavier than the living human subject, and therefore a very trifling motion is sufficient to keep the body on the surface ; but the human body is considerably lighter than sea-water, and it will, therefore, float upon it, without any muscular motion whatever. As an exercise, swimming is both agreeable and healthy; and when once the art is acquired, the best method of coming in contact with the water is, to plunge into it head foremost.

The AMUSEMENTS and RECREATIONS of mankind are almost innumerable; some of these have been mentioned in the preceding articles ; we may here mention *dancing* to the sounds of agreeable music, which, when performed in a large and not very crowded room, and not too long continued, or when performed in the open air, is by some considered a pleasing recreation ; but if long continued, and that too in a crowded room, the mischiefs resulting from the excessive heat and exercise, are often very injurious, and, to many delicate females, have been doubtless the cause of pulmonary consumption.

The THEATRE may also be mentioned as a source of considerable excitement to a large body of the people ; and, under suitable regulations, offers, by proper examples, a moral stimulus to propriety of

conduct, as well as an agreeable method of passing our time.* Although it is to be feared that the late hours at which the theatres of the metropolis now close, are very injurious to the habits of the citizen,

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* The American publishers of the Cyclopædia believing that the theatre never has been, and never will be, under such regulations as to offer "a moral stimulus to propriety of conduct," submit the following extracts on the subject from some of the most respectable publications of different denominations of Christians in this country.

It (the theatre) is indeed abused, and *so* abused, it is a fountain of so much ruin, it is the receptacle of such infamy—there is, as it seems to us, such a needless catering for the grossest appetites, there is such an unseemly and shocking vicinity of innocence with the most shameless corruption, that we can speak of the theatre, in its present state, only in terms of *utter reprobation*. We seriously think that good men ought to do something to purify this amusement, or to forsake it entirely. CHRISTIAN EXAMINER.

I am safe in saying, that, when it has been asserted in respectable quarters, that the income of the many places of refreshment, so called, beneath that roof, (the theatre) is such as, along with other indications, proves that it could be furnished only by a vast amount of expensive sin ;—and that part of the building, moreover, has been the scene of the most odious practices,—that it appears to have been *not merely an introduction to the brothel, but a brothel itself*,—it is safe to say, that it is time for the guardians of the young, and for all good citizens, to take the alarm, and ask if these things are so.

REV. MR. PALFREY.

The Hon. William Sullivan, speaking in the name of a Committee of which he was a member, in relation to the Tremont theatre, Boston, observes,

"They (the committee) were unwilling to be silent, when they supposed it even possible, that their sons, apprentices, and wards, hitherto unoffending and innocent, might be seduced to become, *first* spectators of iniquity, *then* partakers in it, and *finally* victims in a course of folly, leading to felonies, and to irretrievable ruin. If it is forbidden to parents, masters, guardians, and citizens, to take such peaceable and lawful measures, as they think proper, to save *the young* from folly, vice, and crime, it is time to shut up our school houses, and places of public worship, and leave the care and duty of moral instruction, to theatres."

We congratulate our readers on the manifest change in public sentiment in regard to the theatre, which has been showing itself for a considerable time past. This change is apparent in the diminished attention now paid to the theatre. The time has been, when Boston was cursed with two or three of these haunts of wickedness, regularly open, and often thronged ; but for the last year, there has been but one in operation, and this, we are told, not numerously attended, and with difficulty supported. The time has been, when some of the most respectable people in Boston were accustomed to attend the theatre with their families ; but latterly not a few of this description, and these, too, not in our sense of the word decidedly religious, have withdrawn from it, we trust forever. The time has also been, when,

upon whose regularity and nocturnal repose they are too apt deeply to intrude.

Of LITERARY INSTITUTIONS, as places of rational amusement, we are desirous of saying a few words, chiefly because they are of recent establishment, and their utilities are not so generally known as they ought to be. To the boisterous field sports, such as *hunting*, and *shooting*, and even to the more placid amusement of *angling*, there are several strong objections, the chief, however, of which is, that they all tend, more or less, to encourage *inhumanity to animals;* but to the agreeable excitements to be obtained at our Literary Institutions no objections can be made. At these *academies* are usually to be found a good library, the newspapers, the magazines, reviews, and other periodical publications; and at some of them instruction is given in the languages; besides which, Lectures, by experienced professors, are usually given on the various sciences, polite and useful arts, with suitable experiments, when the subjects are such as to require them. At such places, the taste must be fastidious indeed, which, after the hours of business, could not find something here with which to be instructed or amused. The institutions of this kind in the metropolis are become numerous, and almost every town of any importance in the kingdom has one at least of such literary associations.

The sedentary amusements of *chess*, *draughts*, and *back-gammon*, when none of these involve money transactions, may be occasionally found useful, by removing the mind, as it were, from its customary habits and occupations, particularly at those seasons of the year when the weather prevents us from the agreeable excitement of walking in the fields and the open air. But all such games of chance, when mixed up with money, tend generally to induce a habit of *gambling*, than which one more pernicious or destructive to peace of mind, and frequently to fortune, can scarcely be conceived; and therefore our advice is, never to engage in them where money is the stake.

ALIMENTS.

WATER, next to *air*, of which we have treated in a preceding article, is one of the most important and necessary aliments for the support of the body. It enters largely into the composition of most of our fluids, some even of our solids, and requires to be constantly administered to us to supply the waste continually passing off by the various excretions; and in warm weather, as well as when the body is heated above its usual temperature, more particularly by *perspiration*, from every part of the surface of the body; as well as continually by the lungs. A deficiency of water is soon manifest to us by the sensation we call *thirst*, as that of more solid aliment is known by *hunger*.

Water was formerly supposed to be a simple body, and called one of the elements. But the researches of modern chemistry have prov-

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to speak of the theatre as a nursery of vice, or even as of an immoral tendency, could hardly be tolerated in some professedly religious circles; but in these same circles it is now denounced in no measured terms of reprobation. SPIRIT OF THE PILGRIMS.

ed beyond a doubt, that it consists of *hydrogen* and *oxygen*. When two volumes of hydrogen gas are mixed with one volume of oxygen, and the mixture inflamed in a proper apparatus, by the electric spark, the gases totally disappear, and the interior of the vessel is covered with drops of pure water, equal in weight to that of the gases consumed. Again, if pure water be exposed to the action of galvanic electricity, it is resolved into two volumes of hydrogen and one volume of oxygen. Thus synthetically and analytically is the composition of water known.

Pure water is transparent, and without either colour, taste, or smell. At the temperature of 40° it is at its greatest density. A cubic foot of water weighs, except a trifling fraction, 1000 ounces; a cubic inch 252,953 grains. A pint of pure water, wine measure, weighs, or is assumed to weigh, sixteen ounces avoirdupois.

At the temperature of 32° water becomes ice; the specific gravity of ice is 0.94; ice, of course, floats on water. Water exposed to heat in open vessels, boils at 212°. But water boils at different temperatures, depending upon the pressure of the atmosphere. At the top of Mont Blanc it boiled, according to Saussure, at 187°.

Concerning the general uses of water it is unnecessary to enlarge; besides, however, contributing so much to the support of animal, it is not less necessary to vegetable life; without the continual presence of water, the earth would cease to be fruitful, and the vegetable creation must perish.

The purest water, and of course that which is the softest, is unquestionably the best. But soft water, containing much vegetable or animal matter, in a state of decomposition, is much less wholesome than hard spring water. Next to pure rain water, the water of a rivulet in continual motion, is, perhaps, the best.

BREAD. This substance, and the method in which it is made, are too well known to need a particular description; but as one of the most useful aliments, it may be necessary to make a few observations on it. It is made, as is well known, from different species of grain; *wheat, barley, rye, oats*, &c.; but of all the articles of which bread is made, none is so nutritious as that which is obtained from wheat. This arises from the fact, that wheat contains not only more nutritive matter as a whole, but it also contains considerably more *gluten* than any other grain with which we are at present acquainted. Of 1000 parts of *Middlesex wheat*, according to Sir Humphry Davy, the whole quantity of nutritive matter is 955 parts; of these *mucilage*, or *starch*, forms 765, and *gluten* 190. An analysis of some *Sicilian wheat* produced 961 parts of nutritive matter, of which 722 parts were *mucilage*, or *starch*, and 239 *gluten*. In short, it appears from numerous experiments, that wheat generally contains at least *double* the quantity of gluten found in most other grain, as well as considerably more starch than either *oats*, *beans*, or *pease*. Norfolk *barley*, however, contains more starch than wheat; but as its proportion of *gluten* is much less than in that grain, it is neither so nutritious, nor will it make such good bread as wheat. It appears, too that no grain which does not contain a considerable quantity of gluten will make good bread; the gluten being essential to the raised or porous appearance of it. *Gluten* is, besides, a peculiar substance, which approaches much nearer to the nature of animal matter than any other vegetable production, and hence we may learn why it is more likely to assimilate with, and

nourish the animal body. Gluten yields, by destructive distillation, ammonia, and appears to be, in other respects, similar to the substance found in animals called albumen.

We may just add, that wheat contains, besides the ingredients above mentioned, a portion of sugar; and as unfermented flour, when taken into the stomach almost immediately enters into active fermentation, producing flatulence and other unpleasant consequences, the necessity for its being first fermented, and afterwards baked, to complete the process, so as to render the bread suitable for the stomach, is apparent.

STARCH, as we have seen in the preceding article, forms a large portion of the composition of wheat, as well as innumerable other vegetable substances. It is well known as a white powdery substance, insoluble in cold, but readily soluble in hot water, when at a temperature between 160° and 180°. Its solution is gelatinous, and, by careful evaporation, it yields a substance resembling gum in appearance. It appears that in their ultimate elements *starch* and sugar differ little in composition, and hence it often happens that the former is converted into the latter. Starch is nevertheless much better calculated for human food than sugar, as it does not appear to undergo in the stomach that peculiar change which saccharine matter frequently does, producing flatulence and other unpleasant symptoms. Besides the uses of starch as food, in various vegetables, it is used for many purposes in the arts and manufactures; and also occasionally as a medicine.

SUGAR, or *Saccharum*, is the general basis of sweetness in all vegetable substances. It is found also in milk, and a few other animal secretions. It is obtained from various vegetables in considerable quantity, but more commonly from *beet root*, and from the juice of the *sugar maple*, a tree growing plentifully in the back settlements of North America. But most of the sugar found in this country is obtained from a reed or cane growing in the East and West Indies.

Whether the ancients were acquainted with this cane, or knew how to express the juice from it, is uncertain. If they did know the cane and the juice, they knew not the aet of condensing, hardening, and whitening it, and consequently knew nothing of our sugar. Salmasius assures us, that the Arabs have used the art of making sugar, such as we now have it, about 800 years. The sugar cane was brought from the north of Africa to Italy in the eleventh century. Labat states, that the sugar cane is as natural to America as to India; but the Spaniards first learned from the Orientals the art of reducing it into sugar.

The *Common sugar cane, saccharum officinarum*, has flat leaves and panicled flowers; it has a jointed reed-root, from which ascend four or more shoots (proportionable to the age and strength of the root) eight or ten feet high, according to the goodness of the ground; in some moist soils the cane has measured twenty feet, but such are seldom so productive. This species of the sugar cane has three varieties, the *white*, the *red*, and the *elephantine sugar-cane*. It is a native of both the Indies, and also of the islands of the South Sea. It may be increased by slips or suckers from the root, or by cuttings. In its natural climate it is planted by cuttings in parallel furrows, where it comes to perfection in about fourteen months; when ripe, the reeds are cut off at a joint near the root, cleared of the leaves, tied up in

bundles, and sent to the mills, where, being cut in short pieces, they are squeezed till all the juice is obtained from them. It is then evaporated, with the addition of a small quantity of lime, until it becomes thick, when it is transferred into wooden coolers, where a portion concretes into a crystallized mass, which is drained and exported to this country, under the name of *muscovado*, or *raw sugar*. The remaining liquid portion is called *molasses*, or *treacle*, which in the West Indies, with other refuse saccharine matter, is commonly converted into *rum*.

Sugar is *refined* in this country by boiling it in pans with lime water, mixed with a certain portion of bullock's blood. The albumen of the blood mixes with the impurities of the sugar, which, rising to the surface, are skimmed off. Occasionally, we believe, the whites of eggs and butter are also used. When the sugar is sufficiently purified, it is placed in coolers, where it is violently agitated till it becomes thick and granulated; it is then poured into conical earthen moulds, previously soaked in water, and again agitated. When sufficiently cold, the moulds, with the sugar in them, are set with their broad ends upwards, in earthen pots, when the first portion of liquid molasses runs down; pipe-clay mixed with water, to the consistence of thick cream, is now laid upon the sugar about an inch thick; the water, leaving the pipe-clay, descends through the sugar, washing out the molasses and other colouring matter. The process of claying is often repeated. The loaves are afterwards dried in a stove.

The first account we have of sugar-refiners in England is in the year 1659. Sugar is a very useful commodity; it preserves both animal and vegetable substances from putrefaction; and it is one of the principal ingredients in innumerable preparations of food, preserves, and sweetmeats. It is no doubt nutritious when taken in moderate quantity; but it is very apt to disagree with weak and dyspeptic stomachs.

SUGAR CANDY is sugar crystallized. It is either white or brown, according to the sort of sugar used. It is said that raw sugar is better for candying than refined. The process of making sugar-candy is simply to dissolve the sugar in water, to boil and clarify it by skimming, &c. and then place it in suitable containing vessels, and in a certain degree of heat, so that the sugar may crystallize upon threads stretched across the vessel. Candy is used by miniature painters, to prevent the colours from cracking, when mixed with gum-arabic.

BARLEY-SUGAR is so called, because the sugar was formerly boiled in barley-water. It is first boiled till it is brittle, and then cast on a stone anointed with oil of almonds, and afterwards formed into twisted sticks, as we see it. Sometimes saffron is added to it to improve its colour. Barley-sugar is occasionally useful in colds and hoarseness.

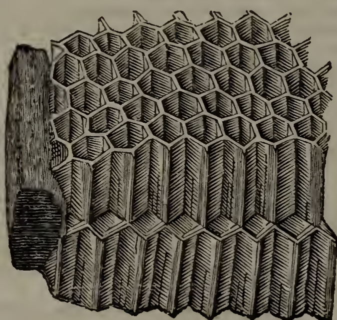
SYRUP is a solution of sugar in water; it is also occasionally flavoured with vegetable matters; and hence various syrups, such as *violets*, *poppies*, &c. are found in the apothecaries' shops.

TREACLE, or MOLASSES. The chief difference between this article and sugar appears to be in its mucilaginous, or gummy, colouring matter; it is more laxative than refined sugar; and may by dilution, and the addition of yeast, be made to undergo the vinous and acetous fermentations. In the first, a considerable portion of spirit may be obtained from it, flavoured of course with the peculiar taste which

the sugar imparts, as in *rum*, the taste of which arises, no doubt, from the essential oil of the sugar.

HONEY is very similar in its properties to sugar. It is collected, as is well known, by bees, from a variety of flowers, and deposited in the cells of their combs, there to remain till wanted for their food. It varies in flavour and consistence according to the nature of the flowers from which it is collected. We have Minorca, Narbonne, and English honey. The honey obtained in this country is sometimes white, called *virgin* honey, that is, the honey obtained from the bees the same year in which the swarm was placed in the hive; when the honey is discoloured, it is either so from the bees feeding on *heath* and other mountain flowers, or from the combs and bees having been in the *same* hive for two or more years. In France, it is said, that a good swarm of bees will, in two years, yield nearly thirty pounds of honey; in this country, however, nothing is more uncertain than the product of bees. Honey, by being mixed with a suitable portion of water, and fermented, becomes *mead;* a vinous liquor, by some persons much admired. Considerable quantities of honey are produced by the wild bees in the woods of North America. We do not know that honey, as food, is in any respect superior to sugar.

The natural history of bees is very interesting; Dr. Bevan has lately published a work on bees, which is deserving the attention of the curious. The *honey-comb* of the bee is at once singular and geometrical.



[A honey-comb, with the front row of hexagonal cells cut across. The angle of the planes, forming the roofs of each cell, is shewn in the front row; and it is the precise angle of all others, giving the most room, and saving the most space, wax, and work.]

It is formed by the bees of the material called *wax*, which they collect from the vegetables which they visit; whether it undergoes any change by those little animals, is not, we believe, exactly known. The cells are designed, not only for the reception of the honey, but also for their eggs. Each cell is composed of six plane sides, which are all equal to each other; the bottom of the cell is so disposed as to con-

stitute a solid angle under three equal angles. Hence a less quantity of surface is sufficient to contain a given quantity of honey than if any other form had been observed, and a fifth part of the wax and labour is saved. The celerity with which a swarm of bees will bring the work of the combs to perfection is amazing; vast numbers are at work at once; and that they may not incommode one another, when the foundation is laid, we see the beginning of three or four stories made at once, and certain portion of the bees allotted to carry on the work of each.

Of BEES-WAX we may just add, that it is used pretty extensively in the arts as well as in medicine; in the state in which it is obtained from the combs of the bee, it is called *yellow wax*, and when deprived of its colour, purified, or bleached, *white wax.*

SALT, COMMON SALT, *muriate of soda*, or *chloride of sodium* by the most correct and recent nomenclature, is a saline crystallization used to season and give pungency to various kinds of food; as well as to preserve it on numerous occasions from putrefaction. Salt is obtained from three different sources, namely, the *water of the sea*, *mines*, where it exists in a solid form, called *rock salt*, and from *saline springs*. *Rock salt* is found in various places: at Nantwich in Cheshire, at Cracow in Poland, and in Hungary, Catalonia, in Africa, Asia; and in America, forming hills or very extensive beds above the surface.

Rock Salt, it is said, was entirely unknown to the ancients. The Polish mines near Cracow were discovered in 1251; their depth and capacity are surprising. Within them is found a kind of subterraneous republic, which has its polity, laws, families, &c.; and even public roads, carriages, and horses, for the conveyance of salt to the mouth of the quarry, where it is taken up by engines. These horses when once down never see the light again; but the men take frequent occasions of breathing the village air. When a traveller arrives at the bottom of this strange abyss where so many people are interred alive, and where so many are even born, and have never stirred out, he is surprised with a long series of lofty vaults sustained by huge pilasters cut out with chisels; and which, being themselves rock salt, appear by the light of flambeaux, which are incessantly burning, as so many crystals or precious stones of various colours, casting a lustre which the eye can scarcely bear. One of the chief wonders of the place is, that through these mountains of salt, and along the middle of the mine, runs a rivulet of fresh water, sufficient to supply the inhabitants. As soon as the massive pieces are got out of the quarry, they break them into fragments fit for the mills, where they are reduced to a coarse powder, to be used as culinary salt. There are four kinds, white, bay, red, and brilliant; the last is the *sal gemmæ* of the druggists, but not known in this country. All these become white when pulverized, although they appear of different colours in their natural state.

Salt is obtained from *sea water* by different methods. At *Lymington*, in Hampshire, the sea water is admitted into large reservoirs, where, being exposed to the air, a part of the water evaporates; the remaining liquor is then transferred to boilers, where the water is still further evaporated by artificial heat, and then set by to cool and crystallize. The water which remains after the crystallization of the salt is called *mother water*. It contains, or is said to contain, *sulphate of magnesia*, or, as it is usually called, *Epsom salt*, a well known purgative salt;

from this source it is that most, if not all the Epsom salt found in the shops, is obtained by mere evaporation. From the same salt is also obtained the common *magnesia* of the shops. This is what is publicly known of the method of obtaining Epsom salts, but it is believed that the manufacturers keep the real process a secret.

Bay salt, so called because formerly brought from some of the ports contiguous to the *Bay of Biscay*, is usually in larger crystals than common salt; but, it is believed, in no respects differs from it except that, as the large crystals more slowly dissolve, it is better calculated for the preservation of food, where such slow dissolution is advantageous, and it is particularly so for the preservation of *fish*. The *bay salt* now generally found in the shops in this country, is nothing more than a large grained salt tinged with some colouring matter, as turkey umber, to make it appear like the dirty coloured *bay salt* brought from abroad. Our own large crystallized salt, it is believed, is in every respect as good for culinary purposes as any foreign salt whatever. See HERRING.

Besides the salt obtained from sea water in this country, much is also obtained from the *rock salt* produced from the mines in Cheshire; and a great deal is also produced from *brine springs*. At Droitwich in Worcestershire are brine springs which supply not only the surrounding country with salt, but from the port of Bristol it is exported to many other countries. At Borrowdale in Cumberland is a spring, the water of which yields one sixteenth, by measure, of salt. At Weston in Staffordshire are salt springs which yield about a ninth part of salt; and near Northwich, at the confluence of the Weaver and the Don, six ounces of salt are obtained from sixteen of water. At Middlewich are salt springs with a fresh brook running between them. These springs yield generally four ounces of salt from a pound of water.

The method of obtaining the salt from all these springs, is so very simple and so much alike as to require no detail. Generally the mere evaporation of the water in large flat pans or boilers, by the application of heat, and when it is reduced to a certain weight or consistence, the liquor is either drawn off into coolers, that the salt may crystallize, or the fire is removed or put out, and the liquor cools, the salt crystallizing in the pan, is all that is necessary.

The uses of salt are innumerable; as a condiment it is not only agreeable to us, but would seem to be even necessary to the support of human life. Its uses for the preservation of food, in the arts, in medicine, and in agriculture as a manure, are so various, great, and important, as to render it, next to air and water, one of the most important products of nature. The duty being now wholly remitted on this valuable commodity, has rendered it an object of still more extensive application in the arts.

CHEESE consists of the curd of milk, the albumen, in combination with various proportions of cream or butter. It is made by mixing with the milk a suitable proportion of *rennet*, mentioned under milk, and after being separated from the whey, is pressed in different sized cakes, and then exposed in an airy place to dry. A certain portion of salt is also necessary in making cheese; but the colouring matter usually put in it called *annotto* is useless. The various qualities of cheese are caused chiefly by the greater or less quantity of butter or animal oil which it contains. The best cheese is that which is

of a dry compact texture, without holes in it, of a whitish colour, and which, upon being rubbed between the finger and thumb, almost immediately becomes a soft and greasy mass. Neither very old, decaying, nor very new cheese is wholesome. But notwithstanding some observations to the contrary, we believe that good cheese, for persons in health, with a suitable portion of bread, is very useful and nutritious food. The *taste* of cheese is produced sometimes by bad management in making it, sometimes by peculiar grasses, or other food upon which the cow is fed; but it is no criterion of its nutritive qualities. Almost every county in England has its peculiar cheese; several are more or less famous for it; Cheshire, Gloucester, Somerset, Dorset, Derby, Huntingdon, Northampton, &c. But that made in *Cheshire*, the cheese called *double Gloucester*, *Cheddar*, and *Stilton cheese*, are generally most esteemed in this country. *Parma* in Italy is also a noted place for cheese, hence called Parmesan. In England cheese is made only with cow's milk, but in Wales, at Rochfort in France, and some other places, it is made with ewes' milk, or with a mixture of this and that of the cow. Cheese without any butter in it is invariably bad; and in drying becomes a hard and almost inedible substance.

BUTTER is too well known to need description; it is merely the oleous portion of milk, first separated in the shape of *cream*, and afterwards still further detached from its aqueous particles or *butter-milk*, by agitation either by the hand or other motion called *churning*. Butter is used chiefly in temperate climates; in the south of Europe and many other places, *olive oil* is used for similar purposes. The Dutch introduced butter into the East Indies. The Romans used butter no otherwise than as a medicine, never as food. Pliny says that among the barbarous nations it was a delicate dish. The Greeks had not an early knowledge of butter. Their poets, though they make frequent mention of milk and cheese, never mention butter. Cl. Alexandrinus observes, that the ancient Christians of Egypt burnt butter in their lamps at their altars instead of oil; and the Abyssinians, according to Godignus, still retain a practice much like it.

Good butter is one of the most wholesome and nutritious of the animal fats: it is necessary, however, that it should be eaten in moderate quantity, and with bread or other farinaceous matter, or it will disagree with the stomach.

Of *beef*, the flesh of oxen, of *mutton*, the flesh of *sheep*, of *veal*, the flesh of *calves*, of *pork*, the flesh of pigs, and of *bacon*, the salted and dried skin and fat of pigs, although primary articles of food, it does not appear necessary to enlarge, as they are all too well known, to need any description here.

JELLY is a transparent and tremulous substance, extracted from calves' feet, hartshorn, bones, skin, fishes, fruits, &c. That obtained from animal substances is usually colourless; that from fruits partakes of the colour of the fruit from which it is obtained. *Animal* jelly is a peculiar substance called by the chemists *gelatine;* it is extremely nutritious, and forms the chief ingredient in soups, broths, &c. Glue and isinglass are dried jellies. The solubility of gelatine in water renders it extremely convenient as food, both in health and sickness. *Portable soup* is also a dried gelatine. Sufficient attention is not paid to this valuable substance; from much of the liquor in which animal food is boiled, may be obtained an agreeable and nutritious

gelatine. The gelatine even of bones may be converted into a solid mass, and used as portable soup.

The jelly of *fruits* consists chiefly, if not entirely, of sugar and mucilage, with, of course, that which constitutes the flavour of the fruit. It is by no means so nutritious as that obtained from animal substances; but many of the vegetable jellies, such as those of currants, raspberries, &c. are cooling and agreeable when taken in moderate quantity.

TEA, *Thea*, or, as the Japanese call it, *Teah*, is the leaf of a tree or shrub growing in several provinces of China, Japan, and Siam; an infusion of which is in general use as drink, and called also *tea*. The tea-plant likes valleys, the feet of mountains, and a stony soil: it is likewise found in mountainous and rocky districts. Its seed is usually sown in places exposed to the south; and bears three years after sown. The root resembles that of the peach tree; the leaves are green, sharpish at the point, and pretty narrow, an inch and a half long, and jagged all around. The flower is much like that of the wild rose. The fruit is of different forms, round, long, or triangular; of the ordinary size of a bean, containing two or three peas, including each a kernel. These peas are the seeds by which the plant is propagated. Botanists have, in fact, distinguished two tea shrubs; one they call *Thea bohea*, or the *Bohea tree* plant; the other *Thea viridis*, or *Green tea* plant; but it is probable that more species, or at least more *varieties* exist than two, as the numerous kinds and qualities of teas would seem to indicate.

The tea tree is a branchy, evergreen shrub, growing to the height of four or five feet, although some have asserted that it reaches thirty. The best time to gather the leaves of tea is while they are yet small, young, and juicy; when gathered, they are passed over the vapour of boiling water to moisten them; they are then laid on porcelain plates, which are heated; and, by thus drying the leaves, they curl up in the manner they are brought to us. It is very rare to find tea perfectly pure; the Chinese always mixing other herbs with it to increase the quantity, though among them it is sold at a price moderate enough; from three-pence to nine-pence per pound. The seasons for collecting the leaves are April, June, and September.

The Chinese know nothing of many names which serve to distinguish tea in Europe, as flower tea, imperial tea, &c. But they have numerous distinctions of their own, as, *voui* and *soumlo*, which are reserved for people of the first quality, or for sick persons.

The green tea is said to be the common tea of the Chinese. F. le Compte calls it 'bing tea,' and says it is gathered from the plant in April, and that the 'voui tea,' 'bou tea,' or, 'bohea tea,' is gathered in March, while in the bud; and hence the smallness of the leaves, as well as the depth of the tincture it gives water. Others, however, take it for the tea of some particular province, the soil being found to make an alteration in the properties of the tea, as much as the season of gathering it. There are yet others who assert, that the colour of the green tea arises from the early period at which the leaves are plucked, when, like unripe fruit, they are generally green and acrid. The leaves of green tea are rolled in the hand previously to their being dried. But it is probable that, from the great jealousy of the Chinese, the mode of preparing the tea leaves is not even now in Europe accurately known.

Tea is made in China, and throughout the greatest part of the east, after the same manner as in Europe—viz. by infusing the leaves in boiling water, and drinking the infusion hot. Indeed with us it is usual to temper its bitterness with sugar, of which the orientals use little or none. The Japanese, however, are said to prepare their liquor in a somewhat different way, viz. by pulverizing it, stirring the powder in hot water, and drinking it as we do coffee. The Chinese often take tea at meals. It is the chief treat with which they regale their friends. The most moderate take it at least thrice a day; others ten times, or more: and yet it is computed, that the consumption of tea among the English and Dutch is as great in proportion as among the orientals. In France the use of tea has for many years declined, and coffee has since become the most prevailing beverage. Much has been said and written about the properties of tea. The reason why the gout and stone are unknown in China is ascribed to the use of this plant; which is further said to cure indigestion, dispel wind, &c. From analytical experiments on tea, made some time since at the Royal Institution, no deleterious properties were detected in either *green* or *black* tea; nor has there been in green tea discovered the least particle of copper. The injurious effects of tea, if indeed any be produced by it, may be attributed, we presume, to the *hot* water rather than to the tea.

The present annual consumption oftea in the United Kingdom is 20,000,000lbs; in 1716 it did not exeeed 300,000lbs.

COFFEE is a seed, or berry, brought originally from Arabia Felix, used for making a drink of the same nature. By coffee we usually mean the drink itself, prepared from those berries. Its origin is not well known; some ascribe it to the prior of a monastery, who, being informed by a goatherd that his cattle, sometimes browzing on this tree, would wake and caper all night, became desirous of proving its virtue; accordingly he first tried it on his monks, to prevent their sleeping at matins. Others refer the invention of coffee to the Persians, from whom it was learned in the fifteenth century by a mufti of Aden, a city near the mouth of the Red Sea; and who, having tried its virtues himself, and found that it dissipated the fumes which oppress the head, inspired joy, opened the bowels, and prevented sleep without his being incommoded by it, recommended it first to his dervises, with whom he used to spend the night in prayer. Their example brought coffee into fashion at Aden: there the professors of the law, for study, artisans to work, travellers to walk in the night, in short, almost every person drank coffee. Thence it passed to Mecca, and from Arabia Felix to Cairo, and from Egypt to Syria and Constantinople. Thevenot, the traveller, was the first who brought it into France; and a Greek servant, called Pasqua, brought it into England in 1652, and setting up the profession of coffee-man, first introduced the drink among us; though some say Dr. Harvey had used it before.

The word coffee is originally Arabic; the Turks pronounce it cahueh, and the Arabs cahuah. The Mohammedans make coffee from the pods as well as the berries; some Europeans have called that made of the pods the flower of the coffee tree. But these being found improper for transportation, the berry is what is used in Europe. The preparation of coffee consists in roasting it on a metalline or earthen plate, till it has acquired a brownish hue. As much is then ground in a mill as serves the present occasion. The manner of boil-

ing it for use needs no description. The Turks do not trouble themselves to take off the bitterness by any sugar, according to our custom. But their grandees add to each dish a drop of essence of amber; others boil with it a couple of cloves, &c. Coffee is one of the necessaries with which the Turks are obliged to furnish their wives. The general method of roasting coffee with us is in an iron cylindrical box, full of holes, through the middle of which runs a spit; under this is a semicircular hearth, wherein is a large charcoal fire; by the help of a jack, the spit turns swiftly, and so roasts the berry; being now and then taken up to be shaken. When the oil rises, and the coffee is grown of a dark brown colour, it is emptied into two receivers, made with large hoops, the bottoms of which are iron plates. There the coffee is shaken, and left till almost cold; and if it look bright and oily, it is a sign it is well done. The oily matter, and its particular smell, distinguish it from peas, beans, barley, rye, &c., which some substitute in lieu of coffee. Some take coffee to promote digestion; but its virtues are not in this country so highly esteemed as on the continent. Although it agrees with many habits, it to others produces considerable inconvenience. There can be no doubt that tea for the generality of mankind is a more suitable beverage than coffee.

Botanists describe ten or more species of the coffee tree; some of these are natives of the East Indies, some of South America, some of Arabia, and some of the Polynesian isles. The tree, however, whence the greater part of the coffee of commerce is obtained, is the *coffæa Arabica*, a native of Arabia, of which there are two varieties; it is a kind of Arabian jessamine, an evergreen, and makes a beautiful appearance at every season of the year. The eastern coffee tree is seldom above eighteen feet high in its native country, or twelve in Europe. The berry, when ripe, is found as hard as horn, which gave rise to an opinion, that the people who cultivated it in Arabia Felix steeped in boiling water, or baked in an oven, all the coffee they sold abroad, to prevent its growing any where else. The coffee tree is said to have been brought from Upper Ethiopia to Arabia Felix; and from the latter country it was conveyed to the West Indies, where it has thriven greatly, so as to supply far the greater part of what is now consumed in Europe.

CHOCOLATE, a kind of cake, or confection, prepared from certain drugs; the basis or principal whereof is the *cacao* nut, or chocolate nut, a nut about the size of an almond, of which from thirty to a hundred are contained in a pod shaped like a cucumber, and very different from the cocoa nut, with which it is apt to be confounded, from the similarity of pronunciation. The drink prepared from this cake is also called chocolate, and is usually drunk warm, being esteemed not only an excellent nourishing food, but also a good medicine; or at least a diet for keeping up the warmth of the stomach, and assisting digestion. The Spaniards were the first who brought chocolate into use in Europe; and by this means they obtained a better market for cacao nuts, annotto, vanilla, and other drugs, which the West Indies furnish, and which enter into the composition of chocolate. The method of making it first used by the Spaniards was very simple, and the same with that in use among the Indians; they only used cacao nut, maize, and raw sugar, as expressed from the canes, with a little achiott, rocou, or annotto to give it a colour. Of these four drugs

ground between two stones, and mixed together in a certain proportion, the Indians make a kind of bread, which serves them equally for solid food and drink; eating it dry when hungry, and steeping it in hot water when athirst. Among the Spaniards the present method of making it is as follows:—The fruit, being gathered from the cacao tree, is dried in the sun, and the kernels taken out, and roasted at the fire, in an iron pan pierced full of holes, then pounded in a mortar, and ground on a marble stone, or in a mill, till it be brought into the consistence of a paste, mixing it with more or less sugar. In proportion as the paste advances they add a little cinnamon or vanilla; some add cloves and anise. The paste is usually made up into cakes, or small rolls. The newest chocolate is esteemed the best; it never keeps well above two years; and usually degenerates much before that time. Chocolate is nutritive and not unwholesome, provided the stomach be active, and exercise be not neglected. It would be less objectionable if the vanilla were omitted, this being of a very heating quality, but on it the flavour chiefly depends. The best chocolate is that which dissolves entirely in the water, leaving neither grounds nor settlement at the bottom of the pot. The Spaniards use it of the consistence of moderately thin honey, and esteem it a great luxury. Spanish chocolate will dissolve by the heat of the sun, or in a vessel on the fire, without any liquid being added. The chocolate made abroad cannot by law be imported into this country; consequently, the chocolate generally to be obtained here is made by persons who understand the art, a knowledge of which is in very few hands. We believe that a small portion of soap is added to most British chocolate, in order that it may froth when dissolved in hot water.

The thin shell of the cacao nut, ground like coffee, and boiled in water, yields a beverage resembling chocolate, but less rich, and is used as an economical and wholesome breakfast by the name of *cacao;* and for delicate stomachs is much better adapted than that oleous compound.

RICE, *oryza*, a grain or seed. It is frequent in Greece, Italy, Spain, the East and West Indies, and America. The grains of rice, which grow in clusters, are severally inclosed in yellow rough cases. Rice grows in marshy places. It is much used in Roman Catholic countries during Lent; and throughout the east, and a great part of the Levant, rice is the principal food, and serves for bread. In the Indies, the women thresh and dress all the rice, which is a very painful office that the men leave to them either through idleness or disrespect. The Chinese make a wine of rice, which is of an amber colour, tastes like Spanish wine, and serves them for their common drink. A weak spirit, termed *arrack*, is also drawn from rice. Rice is less nutritious than wheat, and forms a very useful light food for patients under the influence of medicine. The eastern nations eat their fowls and other meat with rice and saffron. Rice is of a shining white colour, and clear, almost approaching to transparency. The best rice comes from Carolina; an inferior sort from the East Indies. The mountain rice, the *paddy* of the Hindoos, grows in mountainous and other dry soils of India.

The preceding are some of the most important aliments necessary to man; others, on which we must be brief, ought not, perhaps, wholly to be passed over. Among these we may name the POTATO, a plant which is said to be a native of America, and only known to this coun-

try about the beginning of the seventeenth century, although it now forms so large a portion of the food of the inhabitants of the United Kingdom. *Cabbages*, *turnips*, and *carrots*, are also important appendages to our gardens; in our fields, the turnip has become almost a staple commodity for the support of sheep.

Of BARLEY, chiefly as malt and so well known, it is scarcely necessary to speak, see MALT; OATS, however, in Scotland and Wales, still contribute largely to the food of the people, either in the shape of *oatmeal*, which in Scotland is converted into a species of porridge, or in Wales, where it is eaten made into *cakes*. RYE in some districts is also occasionally used as bread. *Beans* and *peas* make also varieties of food on suitable occasions not to be rejected. On the minor produce of the garden and the field it is not necessary to enlarge. The following being *exotics*, and scarcely known in this country, may gratify those who have the curiosity to learn how other nations distant from our own are supported.

The YAM is a root, the produce of a creeping plant whose stalks proceed to a considerable distance, putting out roots from the joints, by which it becomes soon multiplied. The roots consist of blue or brown, round or oblong tubers, each tuber weighing two or three or sometimes twenty pounds. They vary greatly however in size, shape, and colour. The inside of the yam is white, and in mealiness resembles the potato. When dressed they are somewhat like that root; they are considered nutritive, and easy of digestion; they are the common food of the slaves in the West Indies; and if kept from moisture may be preserved for many years. They are ground into flour, and made into bread and puddings. The plant is propagated by cuttings, precisely the same as we propagate potatoes, namely, by cutting the root in pieces, preserving an eye in each piece.

MAIZE, or *Indian Corn*, is the seed of a plant a native of America; it is cultivated not only there, but in many parts of Europe, especially in Italy and Germany. The seed is the chief bread corn in some of the southern parts of America; it also forms a great part of the food of the poor people in Italy and Germany. It is prepared in various ways; sometimes by parching and then grinding it, and mixing it with water; sometimes it is made into bread, or boiled into a kind of soup. It is occasionally raised in this country; but our climate does not appear warm enough for it.

The BANANA is an herbaceous plant said to be a native of Guinea, and thence carried to the West Indies, where it flourishes most abundantly; it also flourishes in Egypt and other hot countries, where it arrives at perfection, from the first planting to the ripening of the fruit, in about ten months. The trunks or stalks are peculiarly porous, the root alone is perennial, the rest dying down to the ground every year. The leaves are two yards long, and a foot broad in the middle. The fruit is four or five inches long, and of the form of a cucumber. The weight of a bunch of bananas usually exceeds twelve pounds. They are never eaten green, but when ripe by all ranks of people, either raw, or fried in slices or fritters.

There is another tree of the same genus growing also in South America, called the *Plantain* tree, the fruit of which is about the size of a cucumber, of a yellow colour, a mealy substance, and a sweetish taste; a bunch of this fruit often weighs forty or fifty pounds; it

is used for food not only by man, but also for fattening a variety of animals, oxen, swine, poultry, &c.

BREAD-FRUIT Tree, a tree growing at Otaheite and other South Sea islands; it was brought to the notice of Europeans by Captain Cook. It has the height and proportion of a middle-sized oak; the leaves are often a foot and a half long, oblong shaped, and in colour, consistence, and sinuosity, resembling those of the fig-tree, and exuding a milky juice on fracture. The fruit is about the size and shape of a new-born child's head, covered with a reticulate skin, and containing a core in its centre. The eatable part lies between the skin and the core, is as white as snow, and of the consistence of new bread. It is prepared for food in various ways. It affords much nourishment, and therefore is esteemed very proper for labouring people. Attempts have been latterly made to naturalize this tree in the West Indies; it can only, it is said, be propagated by suckers or layers.

BARK- BREAD is a species of bread which the Laplanders prepare from the inner bark of pine trees. For this purpose the most lofty and clearest branches are selected, the scaly bark taken off, and the succulent white alburnum is collected, dried on coals till it is friable, when it is pulverized, kneaded with water into cakes, baked in an oven, and eaten as bread. In Siberia, when the ermine hunters find their ferment, with which they make their quass, destroyed by the cold, they digest the inner bark of the pine with water over a fire for an hour, mix it with rye meal, bury the dough in the snow, and after twelve hours find the ferment ready prepared in the sediment.

Fruits.

ORANGES make a considerable article of merchandise. Those called China oranges were first brought into Europe from China by the Portuguese; and it is said, that the very tree whence all the European orange trees of this sort were produced, is still preserved at Lisbon. The China orange is not so hardy as the Seville, and rarely produces good fruit in England; nor are the leaves of the tree near so large or beautiful as those of the Seville orange. There is a great variety of sweet oranges both in the East and West Indies, some of which are much more esteemed than those we now have in Europe; but as they are much tenderer, they will not thrive in this country with the common culture. There are several varieties of the *citrus aurantium*, or orange tree, but they may all be referred to the sweet, or China orange, and the bitter, or Seville orange, the juice of which is sour. Those most esteemed, and that are made presents of as rarities in the Indies, are no larger than a billiard-ball. The juice is cooling and antiscorbutic. Oranges are brought from Nice; Majorca, Seville and other parts of Spain; from Genoa, Provence, Portugal, the Azores, the American islands, China, and the coasts of India. Orange peel is candied in halves and quarters, and sometimes in slender strips, when it is called *orange chips*, and by the French *orangeat.* The French also make a beverage of orange juice, sugar, and water, which they term *orangeade.* The outer rind of oranges is a grateful aromatic; the peel of Seville oranges is that only which is used in medicine. An oil is drawn from orange peel, which is esteemed good

for destroying worms in children, but it is apt to be sophisticated with some expressed oil ; it is, however, easily distinguished, as the genuine fragrant oil drawn from oranges is wholly volatile, and the adulterated is not. The chief use of this oil is as a perfume. A water is distilled on the continent, from the *flowers of oranges ;* it is well known also as a perfume. A solution of sugar in orange flower water makes *capillaire.*

The *seeds* of oranges ought never to be swallowed ; a case of a young lady in this country has recently occurred, in which her death was in all likelihood caused by several orange seeds lodging for a long time in the intestines.

The CITRON is the produce of a tree, *citrus medica,* much resembling the lemon tree. A citron has the same qualities as the lemon, but it is larger, higher coloured, and has a brisker smell. It is an agreeable fruit, and serves, like that, to cool and quench the thirst. Genoa is the great European nursery for this sort of fruit. The Florentine citron, Miller says, is in such great esteem, that the single fruits are sold at Florence for two shillings each, and are sent as presents to the courts of princes. This kind is not to be had in perfection in any other part of Italy except the plain between Pisa and Leghorn, and if transplanted to other parts it loses much of its excellence. From citrons are produced essences, oils, confections, waters, &c.

The LEMON is a variety of the *citrus medica,* or citron tree. There are several sub-varieties of this tree. The common lemon, the sweet, the less sour, and the common sweet lemon, are the four sorts that are brought from Lisbon every year in great plenty. The culture of citrons, lemons, and oranges, merits particular attention. They are elegant evergreens, rising in this country from about five to ten feet in height, forming full and handsome heads, closely garnished with beautiful large leaves all the year round, and putting forth a profusion of sweet flowers in spring and early in summer; which even in this climate are often succeeded by abundance of fruit, that sometimes arrive at tolerable perfection. The most cheap and expeditious method of procuring a collection of this kind of trees is to have recourse to such as are imported from Spain, Italy, and Portugal. These come over in chests, without any earth to their roots, and with their heads a little trimmed; they are commonly from one inch to two or three in diameter in the stem; from two to four or five feet in height; and by the assistance of a bark bed they readily take root, and grow freely ; forming as good trees in two years, as could be raised here by inarching or budding in fifteen or twenty. They are sold in the Italian warehouses in London. Their price is from three shillings to a guinea each. The fruits of the citron, lemon, and orange trees, yield very agreeable acid juices, which, besides the uses to which they are commonly applied, answer considerable purposes in medicine. The very small, immature fruit of the Seville orange dried is used in medicine under the name of *aurantia curaslavensia,* or *curassavica,* Curassoa oranges.

Essence of Lemon is obtained from the exterior rind of the fruit, either by compression or distillation ; it is an impure essential oil, as found in the shops. It is imported chiefly we believe from Spain.

The MELON is a species of the cucumber. The Cantaleupe melon, so called from a place in the neighbourhood of Rome, and whither it was brought from Armenia, is in the greatest esteem.

There are various other kinds cultivated in different parts of the world. Mr. Reynolds has communicated to the Society of Arts a method of raising melons without earth, dung, or water; and for this purpose tanner's bark, saw-dust, &c. are used to promote the vegetation of those seeds. When a melon is perfectly fine, it is full, without any vacuity; this is known by knocking upon it; and when cut, the flesh must be dry, no water running out, only a little dew, which should be of a fine red colour. Large melons are not preferred, but firm and well-flavoured ones. Our gardeners, who raise melons for sale, sow the seeds of the larger, rather than good kinds, and they increase the size of these by much watering the roots, but this spoils the taste. Some of the French raise particularly fine melons, by a method pretended to be a secret, but which is the same with that of Mr. Quintiny's published above a century ago. Valencia, in Spain, produces the finest melons in Europe.

OLIVE, or *olea Europæa*, an evergreen tree common to the woods of the south of France, Spain, and Italy. It rarely exceeds twenty feet in height; it has lanceolate, grey, ferruginous leaves, downy or silvery underneath; the flowers are small and white; the fruit is a drupe of an oblong form, about an inch and a half or two inches long, and black when ripe. Many varieties. With a little protection it will live against walls near London. In Devonshire it will grow as a standard; its fruit will not, however, ripen in this country. Abroad it is propagâted by shoots, which are grafted to produce good sorts. In England it is propagated by layers. The most valuable part of this tree is the fruit; from which, when ripe, is obtained the *olive oil*, so well and universally known as food and as a medicine. Olives are brought into this country pickled as a condiment; but they are neither good nor wholesome food.

The ALMOND is a fruit inclosed in a thick stone, and under a thin skin. The tree that produces the almond is pretty tall, and resembles a peach tree. It is frequent in Germany, France, Spain, and the neighbouring countries, and also in Barbary. The flowers of this tree are ranged in the rose manner: the pistil becomes a fleshy fruit, containing a seed which is the almond, and which drops out when the fruit is arrived at maturity. There are two kinds, sweet and bitter; and it has been said that the same tree, by a difference in culture, has yielded both. Some affirm that the bitter almonds bruised, kill or stupify fowl, so that they may be taken with the hands; which they say is a secret practice among the Bohemians. It is known that bitter almonds poison dogs. They are not now used in medicine, except for the purpose of obtaining the oil of almonds; that being exactly of the same quality, whether expressed from bitter or from sweet almonds. In flavour, bitter almonds resemble water distilled from laurel leaves, and contain Prussic acid, which, in a pure state, is extremely poisonous. Sweet almonds are of a soft grateful taste; and are reputed cooling, healing, and nutritive. The *oil* of almonds is a safe emollient in pains arising from the stone and gravel; in coughs and hoarseness; and for costiveness and gripes in children.

TAMARINDS are brought from the East and West Indies. Some call them Indian dates, others Indian acacia. The tree which yields this fruit is called by the Indians, tamarinds, and by the Portuguese, tamarindos. It is not unlike our ash; its leaves resemble those of female fern; its flowers are joined eight or ten together, like those of

the orange tree. Its fruit is a pod, from two to five inches or more in length, covered at first with a green rind, which afterwards becomes brown, and contains a blackish acid pulp, among which are found seeds resembling lupines. Tamarinds must be chosen large, the pods unbroken, and of a brisk taste. Those brought to this country in *small* casks and preserved in sugar, not syrup, are the best. They are laxative, cooling, and good to quench thirst. These trees grow to a great magnitude in their native countries; but in Europe they are preserved as curiosities by those who are lovers of rare plants.

PRUNES are plumbs dried and baked in an oven, or in the sun. The prunes chiefly used among us are black; they were formerly brought from Bourdeaux. Great quantities are used by the English and Dutch. Prunes are slightly laxative. The *prunello brignole*, or *French plum*, is less dried than the common prunes, and much more grateful to the taste.

The CACAO *nut*, mentioned under chocolate, is the seed or fruit of the *theobroma cacao*, or chocolate-tree, which grows in several parts of the West Indies. It resembles our cherry-tree; but is so very delicate, and the soil it grows in so hot, that, to guard it from the sun, it is always planted in the shade of another tree, called mother of cocoa. Within the pod of the fruit is formed a tissue of white fibres; in the middle of these fibres are contained ten, twelve, or even forty grains or seeds of a violet colour, and as dry as acorns. Each grain, which is covered with a little rind, separates into five or six unequal pieces, in the middle whereof is a kernel, having a tender bud, very difficult to preserve. Of this seed, with the addition of other ingredients, chocolate is made. Some Spaniards have made five thousand pounds per annum from a single garden of cacaos. In several parts of America, the cacao grains are used by the Indians as money; twelve or fourteen are esteemed equivalent to a Spanish real, or five-pence three farthings sterling.

The COCOA *nut* is the fruit of the *cocus nucifera*, a tree of the family of palms. It is of a large size, being sometimes near a foot in length. Like the walnut it has a soft external husk, from the fibres of which cordage may be made. This husk, in its early state, is edible, and agreeably acid. The hard shell is sometimes mounted with silver for drinking cups, or sugar basins. Within the shell is a large white kernel, pleasant to the taste, inclosing a very grateful fluid called milk of cocoa. An oil like that of almonds may be obtained from the kernel.

The POMEGRANATE is a fruit in the form of an apple or quince, full of seeds or kernels, inclosed within a reddish pulp, sometimes sweet, sometimes acid. It is so called either from the abundance of its grain or kernels, *pomum granatum*, a kernelled apple, or from the country where it was anciently produced, viz. Granada. The pomegranate is, however, a native of the south of Europe, and grows to the general height of an apple-tree; the branches are a little prickly; the leaves resemble those of the great myrtle; and the fruit, which is composed of red angular grains, is inclosed in little distinct cells, the whole of which are enveloped by a thick and highly astringent outer rind. Pomegranates are by some esteemed. Of the kernels are made syrups and preserves; the *peel* contains a considerable quantity of astringent matter.

A FIG is a most delicious fruit, the produce of a tree of the same

name. Figs are of several kinds; the black and the violet coloured are the worst: the white are esteemed the best. They are dried either by an oven or the sun, and in this state they are used both as medicine and food. The best figs are the produce of Italy, Spain, Provence, &c. The islands of the Archipelago yield figs in great abundance, though inferior in goodness to those of Europe. The Greeks in those islands cultivate them with wonderful care and attention, making them their principal food, and a considerable part of the riches of the country. Figs are gathered in autumn, and generally laid on a rack or hurdle to dry in the sun. They are found to contain mucilage, sugar, and some oil. They are very nourishing; yet when eaten freely they often produce much inconvenience. They are used to make gargarisms against disorders of the throat and mouth: they are also applied externally to soften and promote the maturation or suppuration of tumours, particularly when *toasted* and applied to swelled gums.

RAISINS are grapes prepared by suffering them to remain on the vine till they are perfectly ripe, and then drying them in the sun or in ovens, to fit them for keeping, and for some medicinal or culinary purposes. There are various kinds; as raisins of Damascus, which are brought to us flat and seeded, of the size of the thumb, whence we may judge of the extraordinary bulk of the grape when fresh. Travellers mention bunches that weighed twenty-five pounds. Their taste is faintish and disagreeable. There are numerous other sorts, which are denominated from the place where they grow, &c.; as the raisins of Calabria, Malaga, Muscadine raisins, &c.

CURRANTS are so called because formerly coming from the Isthmus of Corinth. They come from several other places of the Archipelago. The little Spanish currants are sometimes sold for them. They are a kind of small raisins or dried grapes of different colours, red, white, or black. They must be chosen new, small, and in large masses. When made up in bales they may keep two or three years, without stirring or giving them air. The island of Zante is the chief place whence currants are brought; in the Morea, or the Isthmus of Corinth, which was anciently the principal plantation, and whence the Latins denominated them *uvæ Corinthiacæ*, they are no longer cultivated; the jealousy of the Turks not allowing large vessels to enter the gulf to take them off the collector's hands. They grow on vines like our grapes; except that the leaves are somewhat thicker, and the grapes smaller; they have no stone. The planters gather them in August, dispose them in couches on the ground till dry, then clean them, and lay them up in magazines. On barrelling them for sending abroad, they have people to tread them close, that they may keep the better. Zante produces enough yearly to load five or six vessels; Cephalonia three or four; and the other islands one. The Zantiots know but little of the use we make of them.

DATES; the fruit of an oblong shape of several kinds of palm trees. The dates found in the shops of this country are said to be the product of the *Phœnix dactylifera*, or *date palm*, a native of the Levant, Arabia, Persia, and Africa, where they are eaten as food. Before they are ripe they are rather rough and astringent: when perfectly matured they are much of the nature of the fig; but they have an oblong drupe, or stone, with a deep furrow running longitudinally, in the middle of the pulp. Senegal dates are said to be the best. It is

said that no tree whatever is used for so many and valuable purposes as the date palm. Even the stones are given to camels and sheep as food.

Some dates are black, some white, some brown, some again are round like apples, and very large. They are generally oblong, fleshy, yellow, somewhat larger than the thumb's end, and very agreeable to the taste. Some are no bigger than a pea, and others as big as a pomegranate. The best are those called royal dates. There is also another sort, called Caryotæ ; which is very good ; some of them have stones, and others none. Dates are a pleasant but very indigestible aliment. People who live upon dates become, it is said, scorbutic, and soon lose their teeth. Dates are brought from Egypt, Syria, Africa, and the Indies. They never come to full maturity in Italy or the more southern parts of Spain.

The APPLE TREE need not to be described. Linnæus has joined the pear, apple, and quince together, making them all of the same genus. The following are said to be the best for making cider, viz. the red-streaked, the Herefordshire under-leaf, the Devonshire royal wilding, the whitesour, the John-apple, the everlasting hanger, the gennet-moyle, &c. ; but all our cider countries have their peculiar apples for such purpose. Some years ago the *transparent apple* was brought to England from Petersburgh, and was esteemed a curiosity. It was said to be so transparent that the kernels might be perfectly seen when the apple was held to the light ; but in this country it is a mealy insipid fruit, not worth propagating.—The golden rennet ripens at Michaelmas, and for about a month is a very good fruit, either for eating raw, or baking.—The nonpareil is a fruit generally known, though there is another apple that is often sold in our markets for it. It is seldom ripe before Christmas, and, well preserved, will keep perfectly sound till May. This is justly esteemed one of the best apples yet known.—The *fig apple* is supposed by many persons to be produced without a previous flower. In the Philosophical Transactions, there is a letter, written by P. Dudley, Esq. where he gives an account of this tree, and describes it as exceedingly large, and producing great quantities of fruit without any previous blossom. But some again affirm, that a small flower is seen to precede the fruit, though very fugacious, and which seldom continues above a day or two.—The *Paradise apple* has been chosen by some for stocks to graft upon, but these are not of long duration. They have been much more esteemed in France, where the trees were frequently brought to the table in the pots, with their fruit growing upon them. But this being a curiosity, it never obtained much in England.—One of the first apples that is brought to market is the *codlin*, and the next is the margaret apple. The *golden pippin* is a fruit peculiar to England : there are few countries abroad where this succeeds well, nor does it always produce equally good fruit in many parts of England : this is in some measure owing to its being grafted on free stocks. It should be always grafted on the crab stock, which will not canker like the others ; and though the fruit will not be so fair to the sight, yet it will be better flavoured. Mr. Knight indeed has ascertained, that scions taken from old trees die as soon as the parent stock, and that the leaves of such grafts are incapable of digesting the sap of young stocks sufficiently to protract the existence and fertility of the grafted tree.—The *royal russet* is a large, fair fruit, and is one of the best kitchen apples we have. This tree is a very

great bearer, and grows large and handsome; the fruit is in use from October till April. When kept a little while, it is a pleasant fruit to eat. *Pile's russet* is very much esteemed for baking.—*Loan's Pearmain* is a beautiful fruit, of a middling size. The side next the sun is of a fine red, and the other is striped with the same colour. The flesh is vinous, but, as it soon grows mealy, it is not very much esteemed. See CIDER.

PEARS.—Miller enumerates eighty kinds, and observes there are many others. The pear, which in England is commonly called *jargonelle*, is very long, of a pyramidal shape; the flesh of this pear is melting, and has a rich, musky flavour; it is ripe about the middle of July, and is one of the best early summer pears yet known. The *summer burgamot*, by some called the Hamden's bergamot, is a pretty large, round, flat pear, of a greenish yellow colour, and hollow at both ends like an apple; the flesh is melting, and the juice is highly perfumed. The *autumn bergamot* is a smaller pear than the above, but nearly of the same shape; it is a great bearer, and ripens about the middle of September; its juice, like the former, richly perfumed, and its flesh melting. This is one of the best pears of the season. There are other excellent kinds of the bergamot. The red, gray, or green *butter pear*, is a large, long pear, the flesh is melting, and full of a rich, sugary juice. It ripens about the end of September: and when gathered from the trees it is one of the very best sort of pears we have. The *poire de livre*, or pound pear, called also the *poire d'amour*, or love pear, and in England the *black pear of Worcester*, is a very large pear, each of which commonly weighs a pound or more. This is not so fit for eating, but bakes or stews remarkably well. The *German muscat* is an excellent pear, more long than round. It is buttery, melting, and a little musky. This is used in March, April, and sometimes in May. There are many other sorts equally excellent. In describing the names of various kinds of fruits, there is a considerable difficulty; as the same kinds go under different names in different countries. *Perry* is the expressed and fermented juice of the pear.—See PERRY.

QUINCE.—There are the pear quince, the apple quince, the common quince, &c. Six kinds are cultivated in the nurseries near London, but the Portugal kind is most valued for the goodness of its fruit. The quince tree is easily propagated, either by layers, suckers, or cuttings, which must be planted in a moist soil. After the second year they must be managed like apple trees. The quince tree thrives best by the side of a ditch or river, producing more fruit, and of a much larger kind; but those in a dry soil will be better tasted, and much earlier ripe. This tree is of a low stature; the flower and fruit resemble those of the pear tree; but however cultivated, the fruit is sour and astringent, and is covered with a kind of down. It was formerly much esteemed for heightening the colour and flavour of apples baked in pies. The kernels afford by boiling in water a mucilage, which is sometimes used in medicine.

PINE-APPLE.—This fruit is justly esteemed for the richness of its flavour, as it surpasses all the known fruits in the world. The fruit is supposed to have its name from the cones of the pine tree, which it somewhat resembles. There are many species of pine apple; most of them natives of South America, some of Africa, and one or two of the East Indies; but that most known and propagated in this country is the *Bromelia ananas*, a native of America. Pine-apples have

been long cultivated in the hottest islands of the West Indies, where they are plentiful and good. They have also been introduced into our European gardens, so as to produce fruit. The first person who succeeded in this attempt was Monsieur le Cour, of Leyden, who, after many trials, hit upon a proper degree of heat and management, which produced fruit as good, though not so large, as those in the West Indies. From him our gardens in England were first supplied. The most common kind in Europe is the oval shaped pine-apple, with a whitish flesh; but the pyramidal pine-apple with a yellowish flesh, called the sugar-loaf pine-apple, is preferable, being larger and better flavoured, and it may be eaten in greater quantity with less danger. This is likely to be in a few years the most common sort in England. The green pine-apple is the most rare in Europe, though esteemed the best sort in America.

The APRICOT, *prunus Armeniaca* of Linnæus, is considered by botanists as a species of the plum, on the young suckers of which it is now most commonly budded or grafted. There are a great variety of apricots; the *early*, the *white*, the *orange*, the *red*, the *Turkey*, the *Buda*, the *Moorpark* the *Brussels*, and the *peach* apricots. Among these the Buda, the Moorpark, the Turkey, and the Brussels are the most esteemed. As the varieties of the apricot are raised from their stones, *new* varieties from the same source will doubtless be constantly obtained. Apricots are agreeable fruit; but they eat more woolly than peaches or nectarines, and are not therefore so highly esteemed as those fruits. In England apricots are generally ripened on walls; but occasional instances have occurred in the south part of our island, where the fruit has ripened upon the tree as a standard.

PEACH.—A good peach ought to have firm flesh, the skin should be thin, of a deep or bright red colour next the sun, and of a yellowish cast next the wall; the flesh should be highly flavoured, full of juice; the stone small, and the pulp or flesh very thick. When a peach has all these qualities, it may be esteemed a valuable fruit. All the different sorts of peaches have been originally obtained from the stones; which being planted produce new varieties. The French distinguish those we call peaches into two sorts, viz. *pavies* and peaches; the former they make the male, the latter the female. The flesh of the pavies adheres to the stone; and those are called peaches, the flesh of which quits the stone. The pavies are much more esteemed in France; the peaches are generally preferred in England. Miller enumerates thirty-one kinds, but prefers the following.—The early purple, the gross mignon, belle chevereuse, red magdalen, chancellor, belegarde, bourdin rosanna, rambouillet, and nivette. The catharine peach is an excellent fruit. The peach belongs to the almond genus of plants; it is called by Linnæus *amygdalus Persica.*

NECTARINE.—This fruit is a variety of the peach, to which it properly belongs, differing in nothing but the smooth rind, and in the flesh being firmer. The French call this fruit *brugnon*. The early nectarine is of a beautiful red colour, and well flavoured; it is one of the earliest sorts, ripening about the middle of July. The Newington nectarine has an excellent rich juice; this ripens about the beginning of August, and is the best flavoured of all the sorts. The golden nectarine is a fair, handsome fruit, and of a rich flavour; it ripens about the beginning of September. There are other sorts very excellent.

The culture of the nectarine differs in nothing from that of the peach, neither of which ripen without the assistance of the wall in this country.

Of the MEDLAR there are several kinds. The *mespilus Germanica*, German, or common medlar, rises with a deformed tree stem, fifteen or twenty feet high, bearing roundish brown fruit, the size of small apples, which ripen in October, but are not eatable till they begin to decay: for when firm and sound they have an austere and disagreeable taste. Of this species the small Nottingham medlar and spear-shaped Italian medlar are varieties. These are all cultivated in the English gardens. The Nottingham, though a smaller fruit than the German or Dutch medlar is rather preferable for poignancy of flavour and richness. When gathered they may be laid in moist bran, which will hasten their decay. Those laid in straw will not be so soon fit for use, but will be ready in due succession. The medlar has a great affinity to the plants of the THORN genus, and hence it is commonly grafted on white-thorn stocks, on which it flourishes.

The LO-QUAT, or *mespilus Japonica*, is a fruit of the medlar genus, lately introduced into this country. It is a native of Japan, where it becomes a tree of some magnitude and great beauty. Its flowers have a delicate smell resembling the hawthorn ; the shape of the fruit is oval, somewhat like a small apricot ; it is of a pale delicate orange hue partially tinged with red, and covered with a fine down ; it is about one inch and a quarter by one inch in diameter. Although it will grow with care in the open ground in this country, it requires the heat of a stove to make it bear fruit.

PLUMS are almost too well known to need description ; they however furnish an agreeable variety of summer fruit, and when taken in moderate quantity are not unwholesome ; but the acid plums seem to be more wholesome than the sweet ones. Plums are usually propagated by grafting. The most esteemed plums are the *damson*, the *orleans*, the *green-gage*, the *magnum bonum*, *red and white*, the *blue gage*, the *apricot plum*, &c. &c.

Sloes and *bullace* are wild plums abounding in our hedges ; they are a sour unpalatable fruit. *Prunes* are dried plums. See PRUNES.

The CHERRY, *Prunus cerasus*, belongs to the plum genus. It is a native of Asia as well as Europe, and is occasionally found wild in the woods of this country. Cherries eaten in moderate quantity and without the stones, are wholesome. The most esteemed cherries are the *black-heart*, *white-heart*, *Flemish*, *May-duke*, *Bigaron*, and *Morella* cherry ; this last ripens late, and is best adapted for tarts and pies. Cherries are generally propagated by budding or grafting on the stocks of wild cherries obtained by sowing the stones. The preparation sometimes kept in the shops under the name of *black cherry water* is a very dangerous medicine ; it is usually distilled from almond-cake ; and it is now known that a water distilled from the kernels of the fruits of the plum and almond kind is more or less *poisonous*, containing prussic acid.

GRAPES are a grateful fruit too well known to need description. In this country they cannot at present be ripened without the assistance of a wall or a green-house ; although it is said that in England, formerly, were many vineyards which produced an abundance of wine. The *vine*, the plant which produces the grape, is a native of the East Indies and America. It consists of several species and ma-

ny varieties. The most common, however, is the *vitis vinifera*, or common vine, having lobed, sinuate, naked leaves. It is usually propagated by layers or cuttings. Grapes are distinguished into *white* and *red*; and these again into *black sweet water, early white water, white muscadine, black cluster*, and a numerous *et cætera.* Grapes are a delicious summer fruit, and when ripe and eaten in moderate quantity are wholesome. In the warmer countries of Europe they are dried into RAISINS. See RAISINS. The juice of grapes when fermented forms a great variety of wines. See WINE.

The WALNUT tree, *juglans regia*, is a native of Persia. It is propagated either by planting the nut, or, a more certain way of obtaining a good kind, by grafting. The timber of the tree is much esteemed by coach-makers, and also for making *gun-stocks.* So useful is it for this last purpose, that during the last long protracted war the whole kingdom was ransacked for walnut trees, to supply the great demand for it. The leaves of the tree and the covering of the nut have an astringent bitter taste, and are frequently used in *dyeing.* The nut itself contains a large portion of oil, which is occasionally expressed. Walnuts, if duly masticated, are an agreeable and nutricious food.

The HICKORY *nut, juglans alba*, is the produce of an American tree, a species of the walnut. It is occasionally to be obtained in this country, but it is far inferior to the walnut.

The FILBERT and the HAZEL are varieties of the same plant. The first is cultivated in our gardens; the last grows wild almost every where in this country. The nuts of both kinds are consumed in large quantities, and sometimes considerable mischief is produced by their being eaten. They are doubtless nutricious if well masticated. They contain a large portion of oil.

The filbert and hazel will grow in almost any soil or situation; but they are not prolific in a moist clayey one. They are propagated by suckers.

The uses of the wood are very various; for poles, hoops, spars, hurdles, walking-sticks, fishing-rods, &c. &c.

Before closing our account of fruits, we ought perhaps to mention one or two more which form an agreeable variety in our summer food or in our desserts. On these, however, because so well known, we must be brief.

The STRAWBERRY is often found wild in various places in this country; but the varieties obtained by cultivation are at once numerous and delicious.

The RASPBERRY, *rubus Idæus*, a species of the bramble, consists also of numerous varieties; some white, others red. The red is said to be found wild in some parts of this country. An elegant jam and a wine are made from them.

GOOSEBERRIES. The culture of these has been greatly improved during the last thirty years. They are now to be obtained much larger and more rich and juicy than formerly. The neighbourhood of London furnishes the finest gooseberries in the kingdom.

CURRANTS are of three kinds, the *red, white*, and *black.* They are not only used for culinary purposes, but a wine is frequently made from them.

Of the four preceding fruits it may be observed generally, that, eaten in moderate quantity and upon suitable occasions, they are whole-

some; but in immoderate quantity, and if gooseberries, with their skins, they are often injurious, producing flatulence, indigestion, and other unpleasant consequences.

CAPERS are the buds or blossoms of a shrub of the same name gathered green, before they expand into a flower. They are afterward dried in a dark place till withered, and then infused in vinegar, and finally salt is added: in this state they are put into barrels to be used as a pickle, chiefly in sauces. There are thirty different species of the caper bush; the common one is a long shrub, generally growing out of the joints of old walls and the fissures of rocks, and among rubbish. It grows wild in the southern countries of Europe, and in the Levant. All the capers throughout Europe were formerly brought from about Toulon in France; some few small salt capers came from Majorca, and a few flat ones from about Lyons. They are now, however, obtained from various places in the Mediterranean. The bark of the caper tree, when dried, is prescribed by the French physicians in obstructions of the spleen.

Wine, Liquors, &c.

Before we treat of *wine* and other *liquors*, it is necessary that we should make a few observations on

FERMENTATION, which consists in those spontaneous changes that certain vegetable juices or solutions undergo when placed in certain circumstances, and which terminate either in the production of an intoxicating liquor, or in vinegar. The first is called the *vinous*, the latter is the *acetous* fermentation. There is also another species of fermentation termed *putrid*, which is mostly perceived in animal substances.

In every process of fermentation a certain degree of heat is absolutely necessary. The vinous process will, in some of our native juices, proceed when a few degrees above the freezing point; but it proceeds best when between 50° and 70°; if it be much higher there is danger of exciting the acetous fermentation which, of course, in making vinous liquors, we must be careful to avoid. A certain degree of fluidity is also necessary to the due success of the process.

The vinous fermentation takes place only in juices or solutions which contain sugar: for no vegetable juice can be made to undergo it which does not contain it in a very sensible quantity. In beer the sugar is derived from the malt; in wine from the grape: and the expressed juice of the apple and pear contains sugar in considerable quantity previously to its conversion into cider and perry.

Most natural juices go into the vinous fermentation almost immediately after they are expressed; such as the juice of the grape and that of the apple. But the artificial solutions of vegetables, such as that from malt, require some leaven, *yeast*, to begin the process.

In order to the due completion of the vinous fermentation, it is necessary that the juices exposed to it should be obtained from *ripe fruit*, in which the saccharine matter is in the greatest abundance, and the flavour of the fruit in the highest perfection. The juice of unripe fruit ferments very imperfectly, sometimes not at all.

The chief product of the vinous fermentation is an inflammable spirit called *alcohol;* any liquor so fermented as to afford which, we

call *wine :* under this name we of course include not only *wine*, specifically so called, but also beer, ale, cider, perry, mead, &c.

Some bodies to be fermented must first be converted into a fluid state by the agency of water ; hence honey, while it retains its solid consistence, will not ferment ; neither will sugar itself, till mixed with some portion of water.

If the sugar be small in quantity, either in worts or the natural juices, the vinous fermentation soon ceases, and the liquor being exposed to atmospheric air, the acetous fermentation takes place ; during which a quantity of oxygen is absorbed, and the liquor is converted into *vinegar.*

When any of the above-mentioned liquors are distilled they afford a spirituous liquid, the basis of which is alcohol ; but they contain various other substances upon which their flavour and colour depend. That distilled from wine is called *brandy ;* from the fermented juice of the sugar-cane, *rum.* That from wash, *malt spirit ;* this spirit being impregnated with juniper berries, turpentine, &c. is called *gin.*

WINE. There is perhaps no natural production with which we are acquainted, the peculiar qualities of which depend so much on soil and climate as the juice of the grape. Many attempts have been made to transplant the same species of *vine* not only into other countries but merely into other districts of the same province and into apparently analogous soils, yet they have never succeeded without producing a marked difference in the flavour of the wines. Even vintagers often experience a difference between the product of one part of the same vineyard and that of another. Yet all the different varieties of wine seem to depend on the quantity of saccharine and aromatic or odoriferous matter which they contain. Much chemical knowledge indeed and practical skill are necessary, to extract the juice of the grape, and conduct its fermentation to the greatest advantage, and produce the finest wine. If the proportion of sugar in the vine juice (or must) be sufficient, and the fermentation carried to a proper point, the wine is good : but if the sugar be in too great or too small proportion, the wine is less perfect : if the sugar be in excess, part of it remains undecomposed, and the wine is sweet and luscious. On the contrary, if deficient, the wine is weak and thin : if bottled before the fermentation be complete, it will continue to disengage carbonic acid gas in the bottle, and when the cork is drawn will sparkle or hiss, like Champagne and some malt-liquors. White wines are made from white grapes ; red, from purple, crimson, and black grapes. Much of the colour of red wines, however, depends on the mode of preparing them ; if the juice even of red grapes be pressed from the husks, and the liquid allowed to ferment without the husks, the colour of the wine will be very light ; but if the husks (which contain most of the colouring matter, aroma, and nearly all the astringent principle or tannin) be added to the must during the fermentation, their colouring and other matter will be dissolved in the process. It is to this application of the husks of grapes, red wines owe their salutary astringent principles, so deficient in white wines, although the latter generally contain a much greater portion of alcohol or spirit. Most white wines, indeed, are strong and spirituous, as those of Vinaroz, Murviedro, Malaga, Xeres (sherry), Lisbon, Madeira, Frontignac, Bucellas, Hock, &c. Of these, Malaga is the sweetest, and Hock the most acidulous. The principal wines drunk in Europe are the following : 1st. The island of Madeira,

and Palma, one of the Canaries, afford two kinds; the former called Madeira sec; the latter, which is the richest and best of the two, Canary, or palm sec. The name sec (corruptly written sack) signifies dry, and is opposed to sweet. There is another sort of sec wine, prepared about Xeres in Spain, and hence called, according to our vicious orthography, sherris, or sherry. 2d. The wines of Candia and Greece are of common use in Italy. Malmsey was formerly the produce of these parts only, but is now brought chiefly from Spain. Italy produces the *vino Greco*, which is a gold-coloured unctuous wine, the growth of Mount Vesuvius. 3d. Some of the Spanish wines are composed of fermented or half fermented wine, mixed with a thick must, and variously manufactured, or of an infusion of dried grapes in weak must. Valencia, Malmsey, &c. are of this kind. Barcelona furnishes a wine called Jersey port, little, if any thing, inferior in taste to the wine of Oporto, to which it is by some esteemed superior in nutritive qualities. 4th. From Portugal comes red port. A very considerable portion, however, of the wine sold in England as port is made in Portugal, it is said, with logwood, Brazil rum, and aromatic colouring matter, chiefly derived from rhatany root, a product of South America. It is affirmed, that more vessels with wine leave Oporto in one season, than the whole kingdom could produce of the genuine juice of grapes. The best *vino tinto*, a blackish red wine, used by the coopers for colouring other wines, is said to be the produce of Portugal. 5th. The most celebrated of the French wines are Champagne, Burgundy, *vin de beaume*, or partridge-eye, Frontignac, Hermitage, Claret, &c. Among the more esteemed German wines may be reckoned Rhenish, Mayne, Moselle, and Neckar. The Rhenish made in Hockheim (Hock) has been called the prince of the wines of Germany. Beside these wines above mentioned, there are various others. There is also a sort of Malmsey wine made from muscadine raisins.

Method of making and fining wine.—In the southern parts of France they make red wines by treading the grapes, or squeezing them between the hands; after the juice and husks have stood a time, they press them: but for white wine they press the grapes immediately. When pressed, they tun the *must*, and stop up the vessel, leaving the depth of half a foot or more empty, to give room for it to work. About Paris, and in the northern parts of France, they let the husks and must stand two days and nights for white wine, and at least a week for claret wine, before they tun it. To fine it down, they put shavings of green beech into the vessel. Although the juice of the grape generally contains saccharine matter sufficient for fermentation, yet it is usual in some countries to accelerate this process by artificial means, such as heat, &c. If after the first fermentation certain impurities remain, wine-coopers put into it things to help its clarification, as isinglass, whites of eggs, powders of alabaster, calcined marble, roch-alum, &c. The Grecians promote the fining of their strongest wines by a quantity of sulphur and alum. Some sweeten their wines with raisins of the sun. For English wine, the method recommended by Mr. Miller of spreading the grapes upon wheaten straw in a large dry room, and thus exposing them to the air for a fortnight or more, seems worth notice. By this method he assures us he has made English wine as good as any of the best and purest French wines drunk either in Paris or Champagne. Large quantities of wine are made in England from raisins, the loss of the aqueous fluid evaporated in drying

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the grapes being supplied by the addition of water. Private families, particularly in the country, make a great deal also from the juice of currants, or of elderberries, and some from that of gooseberries, with the addition of sugar, and a certain portion of spirit.

But most English wines are bad, when compared with such as sherry, madeira, or port. The chief reason why good wine cannot be made in this country, we apprehend to be, a want of the ripe and perfected juice of the grape; another perhaps is, the climate is not sufficiently warm, to complete the vinous fermentation. English wines are generally flatulent and unwholesome liquors.

Mere-gout, or mother-drop, is the virgin-wine, or that which runs of itself out of the tap of the vat, before the grapes have been trodden in it. *Boisson*, or *draught-wine*, is made of the husks left of the grapes, which are called rape or marc; by throwing water upon these husks, and pressing them afresh, they yield a liquor for servants. The goodness of wine consists in its being net, dry, clear, fine, brisk, without any taste of the vessel, of a clean steady colour; in its having strength without being heady, a body without being sour, and its keeping without growing hard.

CIDER is a well-known vinous liquor prepared from apples, which should be not only ripe, but kept in a dry place for some time before the juice is expressed from them. Fruit fully ripe will produce more liquor, and of a finer flavour, than that imperfectly ripe. The manner of making cider is easy and simple. The fruit is first ground in a mill, and the juice squeezed out by a press; after being strained through a coarse hair sieve, the liquor is put into a vessel or cask to ferment. When the active fermentation is over, a bung is driven slightly into the bung-hole, and, after some time, strongly driven in. This is the simplest, and, we believe the best mode of preserving cider. But some persons rack it off from one vessel to another more than once; and add besides to it isinglass and other materials. The liquor, when fine, may be drawn out, or bottled off, at pleasure. A mixture of fruits is generally considered of advantage to the cider. The pleasant taste of an apple when ripe, is not always a proof of its excellence as a cider apple. But it is quite necessary that all the apples should be ripe. The use of copper or leaden vessels for drawing and conveying the liquor, when being made, is pernicious. From these it receives a metallic poisonous solution, that may be attended with fatal effects.

PERRY is a drink made from pears, after the manner of cider from apples. The best fruits for this use are such as are least fit for eating, as the horse-pear, boreland pear, choak pear, bosbery pear, (not *Barbary* pear, as some authors assert,) &c. The method of preparing perry is the same with that of cider, but it must be observed that the fruit should be fully ripe.

VINEGAR is an agreeable acid liquor, prepared from wine, cider, beer, and other liquors, and it is of considerable use, both as a medicine and a sauce. The word is French, *vinaigre:* from *vin*, wine, and *aigre*, sour. When any of the vinous liquors are exposed to the free access of atmospheric air at a temperature of 80° or 85°, they undergo a second fermentation, the product of which is vinegar. It is useful where a liquor already fermented is employed, to add a portion of yeast or other ferment; for though it would spontaneously run sour, or become changed to vinegar, this change would be too gradual; some would turn mouldy before the last became sour.

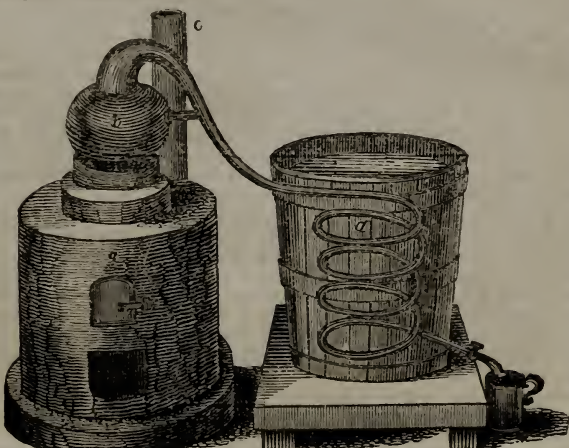
Good vinegar may also be made from a weak syrup, consisting of eighteen ounces of sugar to every gallon of water, mixed of course with a suitable portion of yeast, to excite the first fermentation.

There are four kinds of vinegar known in commerce; that from *wine*, from *malt*, from *sugar*, and from *wood*. This last is called the *pyroligneous acid*, and is now prepared in large quantities in London by distilling wood in close vessels. It may be obtained eight times the strength of common vinegar, so that it may be diluted by the purchaser at pleasure; it is colourless, and very superior to common vinegar.

AROMATIC VINEGAR consists of a solution of camphor and various essential oils in the purest vinegar or acetic acid. It has a most pungent and agreeable odour, and is used for pains in the head, and for purifying rooms in contageous diseases.

DISTILLATION is the art or act of separating or drawing off the spirituous, aqueous, oleaginous, or saline parts of substances by means of fire, and collecting and condensing them again by cold. The use of distillation is very great; by this means, waters, spirits, essences, and essential oils, are chiefly obtained. The fire is either applied immediately to the vessels in which the substances are to be distilled, or mediately by means of water, sand, or iron-filings.

The most common method of distillation is that in which the liquid to be distilled is placed in a *still*, usually made of copper, having a moveable head, with a swan neck, which is so formed as to fit into a refrigeratory or worm, placed in a tub of water, to condense and cool the vapour as it comes over. This process is best adapted for aqueous, oleous, and spirituous preparations, where acids are not present. For the distillation of strong acids and acid liquors, vessels made either of glass, platinum, or stone-ware are used. These are of various forms; to most of them is given the name of *retorts*. The following engraving will give a better idea of the common still than any description whatever.



[*a*, the furnace; *b*, the head of the still; *c*, a part of the chimney; *d*, the worm-tub for condensing the vapour that enters the spiral tube.]

RUM is a spirit obtained by distillation from the fermented juice of the sugar-cane, or from molasses and other coarse saccharine matter in the West Indies. Rum contains a considerable portion of alcohol; but as it contains, in solution, a gross essential oil, which is apt to disagree with some stomachs, is not so good, considered medicinally, as brandy.

BRANDY is obtained by simple distillation from real wines, or the fermented juice of grapes. To distil brandy, they fill the still half full of the liquor from which it is to be drawn, and raise it with a little fire, till about one sixth part be distilled, or till they perceive what falls into a receiver is not at all inflammable. Brandy, when first made, is perfectly colourless; the colour it has in this country is added to it by the dealers in it. The peculiar taste of brandy is produced by a small portion of some essential oil; whether arising from the wine from which it is distilled, or added afterwards, is not known in this country. On this account, in moderate doses, it is very grateful to the stomach. The greatest part of the brandies in use is prepared in France. Of the French brandies, those of Languedoc and Anjou, whence the well known Cognac brandy, are the most esteemed. Of brandy, either plain or rectified, are prepared various kinds of strong liquors, with the addition of other ingredients, sugars, spices, flowers, fruits &c. The strength of brandy may be determined by olive oil or tallow, both of which sink in good brandy.

SPIRIT of WINE is a colourless, and highly inflammable liquid; it was formerly distilled from wines, but it is now usually obtained from a fermented malt liquor, called *wash*. In its purest state it is called *alcohol*, and is one of the lightest fluids known. A wine pint of *spirit of wine*, as directed to be kept by the College of Physicians, ought not to weigh quite 13 1-2 ounces avoirdupoise. The proportion which it contains of alcohol, is 95 parts, and of water 5 in 100. Alcohol forms the most important part of all vinous liquors. Spirit of wine is of great use both in medicine and the arts.

PROOF SPIRIT is also a colourless inflammable liquid, consisting of alcohol and water; but its proportion of water is much larger than that of spirit of wine. As ordered by the London College, a wine pint ought not to weigh more than fifteen ounces. Its proportions consist of alcohol 55 parts, of water 45 parts, in 100. Formerly *brandy* was considered proof spirit, but at the present time proof spirit is usually made by simply mixing a certain portion of spirit of wine with water. Proof spirit is used in innumerable processes in the arts and in medicine.

GENEVA or GIN; the name of a compound water, procured from juniper berries and other ingredients, distilled with malt spirits. The French name of the juniper-berry is *genievre*, from which the word is formed. But our common distillers leave out the juniper berries entirely from the liquor they now make and sell under that name. Our chemists have taught them, that the oil of juniper-berries and that of turpentine are very much alike in flavour, though not in price; and the common method of making what is called *geneva* in London is with common malt spirit, and a proper quantity of oil of turpentine distilled together, with sometimes *angelica root* and other aromatic vegetables. The Dutch, it is said, still continue the original use of juniper berries, and hence the reason why Hollands is by many preferred to English gin. This hot fiery spirit is too much used by the lower

classes of people in its undiluted state as a dram. It is most injurious to their constitution and morals. But, nevertheless, we believe this liquor taken in *moderate quantity, and properly diluted with water*, is a very useful beverage; and that English gin, considered medicinally, is better than *Hollands*.

ARRACK; a spiritous liquor imported from the East Indies, used by way of dram and in punch. The word arrack, according to Mr. Lockyer, is an Indian name for strong waters of all kinds, for they call our spirits English arrack. But what we understand by the name arrack, he affirms to be no other than a spirit procured by distillation from a vegetable juice called *toddy*, which flows by incision out of the cocoa-nut tree, like the birch juice procured among us. Others are of opinion, that the arrack is a vinous spirit obtained by distillation in the East Indies from rice or sugar fermented with the juice of the cocoa-tree. The Goa arrack is said to be made from the toddy; the Batavia arrack from rice and sugar; there is likewise a kind of shrub from which arrack is made. By fermenting, distilling, and rectifying the juice of the American maple, which has much the same taste as that of the cocoa tree, arrack has been made not inferior to any that comes from the East Indies.

ALE is a popular beverage or drink made from malt. The *zythum* and *curmi*, mentioned by Tacitus as the beverage of the ancient Germans, are supposed to correspond with our ale and beer.

MALT denotes *barley* cured, or prepared to fit it for making a potable liquor, under the denomination of beer, ale, &c.

The *manner of making malt* Sir Robert Murray describes as follows:—Steep good barley in a stone trough full of water, till the water be of a bright reddish colour, but it may be known when it is steeped enough by other marks, as by the excessive swelling of the grain, and the degree of softness. It is afterwards taken out, and laid on heaps to let the water drain from it, then turned and laid in a new heap, where it may lie forty hours, more or less. In about fifteen or sixteen hours the grains put forth roots, which when they have done, the malt must be turned over, otherwise the grains will begin to put forth the blade or spire, which must be prevented. It must now be spread to a depth not exceeding five or six inches, and then turned over and over, and thus for the space of forty-eight hours at least. This cools, dries, and deadens the grain, whereby it becomes mellow, melts easily in brewing, and separates entirely from the husk. Then throw up the malt into a high heap, and let it grow as hot as your hand can endure it, which it usually does in about thirty hours. This perfects the sweetness and mellowness of the malt. It is now again cooled and turned over, and then laid on a kiln, with hair cloth or wire spread under it, where, after one fire, it must have a second, and perhaps a third, before the malt be thoroughly dried. The time during which the grain continues on the malt floor varies according to circumstances: fourteen days is, however, the general average. Malt drinks are either pale or brown, as the malt is more or less dried on the kiln, that which is the least dried tingeing the liquor least in brewing, and therefore called pale; whereas the higher dried, and as it were roasted, makes it of a higher colour. High dried malt yields less liquor or beer than low dried or pale malt does, and hence the porter-brewers are obliged to use colouring drugs and many pernicious

stuffs, as substitutes for malt, which is too dear to afford deep-coloured pure malt liquor at the common price of porter.

BREWING is the operation of preparing ale or beer from malt. In brewing, a quantity of water, being boiled, is left to cool till it becomes of the temperature of 175° or 180° ; or till the face can be seen pretty distinctly in the water. Mix the malt with the water, stirring it during the process with the mashing stick. Reserve a few handfuls of the dry malt to strew over the surface, after it is mixed, to prevent the escape of the heat ; the vessel should also be covered besides with cloths, in order to keep the mixture hot ; this operation is called *mashing*. Let the whole stand for three hours, more or less, according to the strength of the wort, which is then to be drawn off into a receiver. The mashing is repeated for the second wort nearly in the same manner as for the first. After these worts are run off, a quantity of hops are added, and the liquor is again boiled. The hops are afterwards strained from it, and when it is moderately cool, the barm or yeast is applied. The barm causes the whole to ferment, and when sufficiently fermented it is tunned up in vessels for use. One, two, three, or more months are necessary to pass, before it will be fit for use. The quantity of malt for making a hogshead, sixty-three gallons, of *strong beer*, may be ten bushels ; for good *ale*, five bushels of malt are sufficient.

HOPS, it is said, preserve malt liquors : if hops were not added, that clammy sweetness, which the liquor retains after working, would soon become acid, and render the liquor unfit for use. The cultivation of hops has become not only an important branch of agriculture, but also a considerable source of revenue. Hops have been lately introduced into medicine as a safe and effectual sedative, allaying pain and promoting sleep, it is said, better than laudanum; their virtues, it appears, reside in a fine yellow powder, readily separable from them by mere rubbing or threshing ; it is called *Lupulin.*

Fish.

It is not our design to enter into a natural history of fish in general, but just to notice the more common kinds, the times of catching them, and the places which they frequent. The principal fisheries for salmon, herrings, mackarel, pilchards, &c., are along the coasts of Scotland, England, and Ireland ; for cod, on the banks of Newfoundland ; for whales, about Greenland and Spitzbergen. The situation of the British coasts is the most advantageous in the world for catching fish ; and the Scottish islands, particularly those of the northwest, lie most commodiously for carrying on the fishing trade to perfection. No country in Europe can pretend to equal Scotland in the abundance of the finest fish, with which its various bays, rivers, lakes, and coasts are replenished. In it there is a corporation entitled the Royal British Fishery.

SALMON FISHERY. The chief in Europe are in England, Scotland, and Ireland, in the rivers, and sea-coasts near the rivers' mouths. The fishing usually begins about the 1st of January, and ends by the last of September. It is commonly performed with nets. Salmon, which will live both in salt and fresh water, go in large numbers in search of this last element, ascending rivers, and leaping high barriers to deposit their spawn. In rivers, salmon are caught

by many other means besides nets. Sometimes a kind of lock or wear is made with iron gates, so disposed that fish, in going up the river, open them with their heads, but have no sooner entered than the gates close, when they are easily taken. In the River Parret, in Somersetshire, besides nets, a sort of wicker traps, of a conical shape, called *buts*, are placed in large numbers together, in which great numbers of salmon are taken; on the sea-shore, near the Parret, salmon are also taken within semicircular hedges of great extent, called *stake hangs*. In some places they fish for salmon in the night by the light of torches or kindled straw. The capture of salmon in the Tweed is prodigious. About July, a boat-load, and sometimes nearly two, are taken at one haul. The coopers of Berwick begin to salt them in pipes and other large vessels, and afterwards barrel them to send abroad. Most of the salmon taken before April, or the setting in of the warm weather, is sent fresh to London; it is generally packed in boxes between layers of ice, in which it is kept good and fresh for many weeks. On the other coasts of Scotland, salmon is cured in the same manner, and, in the spring, great quantities are sent to London. It is said, however, that the best salmon in England is obtained in the *Severn*; it is also occasionally caught in the Thames, and such invariably obtains a great price. In the summer, great quantities are brought to London, chiefly from Newcastle, pickled with vinegar, &c.

COD FISHERY. The cod is a fish of passage, and is usually from eighteen inches to three or four feet long; with a large head, and teeth in the bottom of the throat. Its flesh is white, its skin brownish on the back, and covered with a few transparent scales. It eats excellently when fresh; and if well prepared and salted will keep a long time. The salt-fish or stock-fish, commonly eaten in Lent, is cod thus prepared; although *Ling*, a fish of the same genus, is occasionally preserved in the same way. The grand resort, for centuries past, of this fish, has been on the banks of Newfoundland and near Cape Breton. The vessels used are from a hundred to a hundred and fifty tons burden, and they catch thirty or forty thousand fish a-piece. The most essential article in this fishery is, to have a master who knows how to open the fish, to cut off the heads, and salt them; upon his ability in this the success of the voyage depends. The commerce in this kind of fish is the most secure and advantageous that is known. The best fishing season is from the beginning of February to the end of April, at which time the cods, which during the winter had retired to the deepest part of the sea, return to the bank and grow very fat. Those caught from March to June keep well enough; but those in July, August, and September soon spoil. The fishing is sometimes done in a month or six weeks; sometimes it holds six months. As Lent draws on, if the fishermen have not completed their cargo, they strive to make homeward the first; the market being then best. Some will make a second voyage, before others have got a loading for the first. Each fisher only takes a cod at a time; and yet, an experienced man will take three or four hundred in a day. They salt the cod on board. This description respects the *green cod fishery*. In the fishing of *dry cod*, vessels of all sizes are employed. As cod is only to be dried in the sun, the European vessels are obliged to put out in March or April, to have the benefit of the summer for drying. The principal fishery for dry cod is

along the coasts of Placentia, a sea-port of Newfoundland. The fish intended for this use, though of the same kind as the green cod, are much smaller, and hence fitter to keep. The method of fishing is much the same in both ; only this latter is more expensive, as it takes up more time, and employs more hands ; and yet scarce half the salt is used in this as in the other. When the fish have taken salt, they are laid in piles on the galleries of the scaffold ; when drained, they are ranged on hurdles, and are frequently turned, to dry the better. There are four kinds of commodities drawn from cod, *viz.* the tripes, or sounds, and tongues salted at the same time with the fish; the roes or eggs, which being salted and barrelled up, serve to cast into the sea to draw fish together ; and lastly the oil, which is used in dressing of leather. In Scotland, they catch a small kind of cod on the coasts of Buchan, and all along the Murray Frith on both sides ; as also in the Frith of Forth, Clyde, &c. ; which is much esteemed. They salt and dry them in the sun, upon rocks, and sometimes in the chimney. The usual weight of a cod-fish is from ten to forty pounds ; if larger, it is esteemed a rarity. The writer of this once bought a cod, caught in the Bristol Channel, which weighed sixty pounds ; the largest, perhaps, ever heard of.

HERRING FISHERY. Herrings seem to have been unknown to the ancients. They are chiefly found in the North Sea. There are some other fisheries, but they are not so copious. Our great stations for this fishery are off the Shetland and Western Isles, and off the coasts of Norfolk, in which the Dutch also used to share. Herrings are also common in the season in the Bristol Channel There are two seasons for catching herrings ; the first from June to the end of August, and the second in autumn, when the fogs become favourable for this kind of fishing. The manner of fishing has nothing particular in it. The nets, wherein the fish is drawn, should have their meshes an inch square, that none of the smaller fry may be taken. The signs of the arrival of herring are flocks of gulls; these birds catch up the fish while they skim on the surface ; gannets also plunge and bring them up from considerable depths. Both these birds are closely attended to by the fishers. Cod-fish, haddocks, and dog-fish follow the herrings in vast multitudes ; these voracious fish keep on the outside of the columns, and may be a concurrent cause of driving the shoals into bays and creeks. In a fine day, when the fish appear near the surface, they exhibit an amazing brilliancy of colours ; all the various hues that dart from the diamond, sapphire, and emerald, enrich their track ; but, during night, if they play on the surface, the sea appears on fire, and luminous as the brightest phosphorus. There are two ways of pickling and curing herrings ; the one makes *white* or *pickled herrings*, the other what are called *red herrings*. Pickled herrings, after being assorted into *prime*, *spent*, *shotten-fish*, and *stragglers*, which three last are packed together, are prepared by cutting open and gutting the fish as soon as they are taken out of the water, but the melts and roes are always left in ; they are then thrown into a wooden trough, and a quantity of fine Cadiz salt is thrown over them, and mixed with the hand to-and-fro until it has taken due effect, and the herrings will not slide off the hand or the wooden shovel with which they are turned over. They are afterwards put up in barrels, disposed evenly in rows or layers, well pressed down, salt being previously strewed between each layer. After washing, gutting, and salting the

fish as above, when they intend to make them *red herrings*, they string them by the head on little wooden spits, and hang them in a kind of chimney made for the purpose; and when the chimney is filled, which generally requires ten or twelve thousand fish, they make a fire underneath of brush-wood; this yields much smoke but no flame, which mostly dries them sufficiently in twenty-four hours; they are then barrelled for keeping. Herrings are in general exported to the West Indies, to feed the negroes. The salt used in pickling herrings should be large and coarse grained, so that it may lie between the layers of the fish, and dissolve gradually. We ought to mention here, that notwithstanding what we have stated under salt, page 34, those persons concerned in the herring trade still contend that *foreign salts* are best for preserving herrings; namely, those obtained from Cadiz, Lisbon, and St. Ubes.

MACKEREL FISHERY. The mackerel is a salt-water fish, found chiefly on the French and English coasts, and also in large shoals in many parts of the ocean. It is a summer fish of passage. The fishing is chiefly in the months of April, May, and June, or even in July, according to the place. They enter the English channel in March or April, and proceed toward the straits of Dover as the summer advances; so that by June they are on the coasts of Sussex, Normandy, Picardy, &c. where the fishery is most considerable. They are excellent food when fresh. In the west of England they are also pickled and put into barrels. The fish is taken either with a line or net; the fishery of the latter is more considerable, and is usually performed in the night time. The water wherein mackerels have been boiled often yields a light after stirring a little.

The STURGEON is a large sea-fish, which, at its seasons runs up the rivers, having a sharp pointed snout, flat belly, and bluish back. It is reckoned among the number of royal fishes. The sturgeon is without teeth, and his mouth is placed under his head, like the opening of a purse, which he has the power of pushing suddenly out or retracting. Before this mouth, under the beak or nose, hang four tendrils some inches long, and which so resemble earth-worms, that at first sight they may be mistaken for them. This clumsy toothless fish is supposed by this contrivance to keep himself in good condition, the solidity of his flesh evidently showing him to be a fish of prey. The sturgeon is occasionally caught on the coasts and in the rivers of this country; it is also found in some of the American seas. It is a migratory fish. The flesh of the sturgeon was so valued in the time of the emperor Severus, that it was brought to table by servants with coronets on their heads, and preceded by music, which might give rise to its being in this country presented by the lord mayor to the king. The greatest sturgeon fishery is in the mouth of the Wolga, on the Caspian sea, where the Muscovites employ a great number of hands, and catch them in a kind of enclosure, formed by huge stakes, representing the letter Z repeated several times. Sturgeons, when fresh, eat deliciously: to preserve them, they are salted in large pieces, and put up in kegs. But the chief object of this fishery is the roe or spawn; which is a commodity as much used in Muscovy as butter is in England. The skin makes the best covering for carriages; *isinglass* is also prepared from parts of this fish; *cavear* from the spawn: and the flesh is pickled or salted, and sent all over Europe.

Cavear, Caviar, or Caviary, is the spawn or hard roes of stur-

geon, made into small cakes, an inch thick, and of a hand's breadth, salted and dried in the sun.

PILCHARD FISHERY. The pilchard is less than the herring, and larger than the anchovy. It is a salt water migratory fish. The chief fisheries are along the coasts of Dalmatia, and on the coast of Britany, from Bellisle as far as Brest, and along the coasts of Cornwall and Devonshire. On the coasts of Dalmatia they are so plentiful, as to furnish all Greece, and part of Italy. The coasts of Britany employ yearly above three hundred sloops, and a great number of seamen. The fish caught on our coasts, though larger, are not so much valued as those of France; owing principally, it is said, to their not being so thoroughly cured. The season is from June to September. They naturally follow the light, and will gather about a boat that bears a light in the night time, which contributes much to the facility of the fishery. A great number of men are not only employed at sea, but men, women, and children by land, in salting, pressing, washing them, &c. Dr. Borlace assured Mr. Pennant, that there were at one time inclosed in St. Ives Bay, 7,000 hogsheads, each hogshead containing 35,000 fish, in all 245,000,000.

Of FLAT FISH, the *Turbot* may be especially mentioned as one of considerable delicacy. The *Sole* is also one, very plentiful and nutritious; its skin is sometimes dried and used instead of a file for polishing wood. The *Flounder*, *Plaice*, and *Dab*, may be also mentioned as furnishing occasional varieties of food.

The ANCHOVY is a small sea fish, used by way of sauce or seasoning. It belongs to the same genus as the herring, pilchard, sprat, and shad. Anchovies are caught about the months of May, June, and July, on the coasts of Catalonia, Provence, &c., at which season they pass through the straits of Gibraltar into the Mediterranean. The fishing is chiefly in the night time, when a light being placed on the stern, the anchovies flock round, and are caught in the nets. When the fishing is over, they are pickled in small barrels of different sizes, or in earthen pots.

OYSTERS inhabit European and Indian seas, affixed to rocks, or in large beds. This fish, or worm according to the Linnæan system, is well known as a palatable and nutritious food. There are about 150 species. Dr. Sprat observes, that in the month of May the oysters cast their spawn (which the dredgers call their spats), it is like a drop of a candle, and about the size of a half-penny. The spat cleaves to stones, old oyster shells, pieces of wood, or other things, at the bottom of the sea, which they call cultch. In the month of May the dredgers (by the laws of the Admiralty Court) have liberty to catch all manner of oysters, of what size soever. When they have taken them, they gently raise, with a knife, the small brood from the cultch, and then throw the cultch in again, to preserve the ground for the future. This brood and other oysters they carry to creeks of the sea at Brickel Sea, Mersey, Langno, Fingrego, Wivenho, Tolesbury, and Saltcoase, and there throw them into the Channel, which they call their beds or layers, where they grow and fatten, and in two or three years the smallest brood will be full grown. Those oysters which they would have green, they put into pits about three feet deep in the salt marshes, which are overflowed only at spring tides, to which they have sluices to let in the salt water. These pits, from some quality in the soil cooperating with the heat of the sun, will become green, and communi-

cate their colour to the oysters. Here they remain six weeks or two months. The oysters, when the tide comes in, lie with the hollow shell downwards, but when it goes out, they turn on the other side. They remove not from their place unless in cold weather, to cover themselves in the ooze. The chief places for oysters, for the London market, are the Pont Burnham, Malden, and Coln Waters, which, giving the name to Colne Chester (Colchester), run into a creek of the sea called the Hythe. There is an animal which the dredgers, if possible, destroy, called a five finger, or star-fish, which is said to get into the oysters when they gape, and suck them out. The oysters are sick after they have spat; but in June or July they begin to mend, and in August they are perfectly well. The shell of the oyster is of various sizes, forms, and colours. Some resemble scallops, which leap out of the water to the distance of half a yard, and opening the shells eject the water within them; then sink again under the water, closing the shells with a loud snap.

The oysters brought to London from places contiguous to the entrance of the Thames appear to be the best—those of Milton, Colchester, &c. The oysters obtained on the western coasts of this country are by no means so good, although many of them are considerably larger than the London oysters.

CRAB.—To this genus of insects, agreeably to Linnæus, belong not only the crabs properly so called, but also cray-fish, shrimps, lobsters, &c. The common large crab has its abode in from twenty to forty fathom water. These animals herd together in distinct tribes, and have their separate haunts for breeding and feeding; they will not associate with their neighbours. Crabs weigh from an ounce or less to twelve pounds. All species of crabs cast their shells, though at what season, or how frequently, is not exactly ascertained. Nothing in the history of the crab is so singular as its breaking off its own limbs, which it frequently does; and the creature is able to do this in any position. If at any time either a large or small limb of the crab be seriously wounded, on a sudden, with a crack more or less violent in proportion to the size of the limb, the wounded part drops off. When the leg is off, a mucus overspreads the wound, and stops the bleeding; and a small leg is by degrees produced, which afterwards attains to the size of the former. Nature seems to have given this singular power to this creature for the preservation of its life, in the mutual quarrels with others of its own species. In these, one crab lays hold of the claws of another, and crushes it so that it would bleed to death, had it not the power of giving up the limb, and healing the wound. The fishing of LOBSTERS is all along the British channel, the Frith of Edinburgh, on the coasts of Northumberland, and on the coast of Norway, whence great quantities are brought to London. Crabs are by some esteemed a delicacy; they sometimes are injurious when eaten; lobsters are no doubt to be preferred, as food, to crabs; so also are cray-fish.

The CARP is esteemed the queen of fresh water fish; and, except the eel, lives longest out of the water. Their natural place is a pond; in running waters they rarely, if ever, breed. This fish was brought into England by Leonard Maschal, about 1514; and is valuable for stocking ponds, because of its quick growth and great increase. The carp spawns three times a year: the female does not begin to breed till eight or nine years old. The usual growth of the carp is two or

three inches length in a year; but in ponds which receive the water of common sewers, they have been known to grow from five to eight inches in a year. To make them grow large and fat, the growth of grass under the water should be promoted. For this purpose, when the ponds are very low, the sides should be well raked, and hay-seeds sown plentifully thereon; by autumn there will be a crop of grass, which, when the pond comes to be overflowed, will be a fine feeding place for them. Carp spawn in May, June, and July, according to the warmth of the season. The curious have three ponds for them. They continue to grow for a long time, and to a very considerable size and weight, and have been said to live to be one hundred years old. Isinglass may be obtained from the sounds of this fish; from the spawn is made a *caviare* for the *Jews*, they holding the sturgeon in abhorrence.

The TENCH is a fine fresh water fish. It takes more delight among weeds in ponds, than in clear rivers, and prefers feeding in foul water. Its slime is said to be of a healing quality for wounded fish; hence it is commonly called the fishes' physician. The season for catching this fish is in June, July, and August, very early and late, or even at night, in the still parts of rivers.

The TROUT is a delicious fresh water fish, coming in and going out of season with the buck, and spawning in the cold months of October and November; whereas most other fishes spawn in the hot summer weather. There are several kinds of this fish, all valuable; but the best are the red and yellow trouts, and of these the female is preferred. They are known to be in season by their large backs, which may serve as a rule for other fish. All the winter they are sick, lean, and unwholesome. At the latter end of May they are in their prime.

The PIKE, or *Jack*, is reputed the tyrant of the fresh waters. He is considered the longest-lived of all the fishes: the larger he is found, the coarser the food. This fish never swims in shoals, but always single. It spawns from February to April. The best sort is in rivers; the worst in meres and ponds. This fish bites best about three in the afternoon, in clear water, from the middle of summer till the end of autumn; but in the winter all day long.

A pike in the Marquis of Stafford's canal, at Trentham, once attempted to swallow a swan, and actually got the head into its throat, but could get down no more, and died in the effort, as did also the swan.

The PERCH is a fish not unlike a hog, hookbacked. It is voracious; seldom above two feet long; spawns in February and March, and bites best toward the end of spring.

There are some other kinds of fish, as the *dace* and *dare*, bearing a near resemblance to each other. The *chub*, a fresh water fish, with a large head; an inactive, though strong fish. It spawns in March. The *roach* is not a very delicate fish, and very silly. Those in the rivers are more valued than those in ponds, though the latter are much the larger. They spawn about the middle of May. The *gudgeon* is a small fish of a very delicious taste. It spawns three or four times in the summer season, and feeds in streams.

EEL.—The common eel is both a fresh and salt water fish. The *varieties* of the *common eel* are many, among which may be named the silver eel: a greenish eel, called the *grey eel;* a blackish eel; and an

eel with reddish fins. There is also a variety in the river Thames, called *grigs*, and about Oxford *grigs* and *gluts*. The young, when it comes from the female, is no bigger than a needle. Eels hide themselves in the winter in the mud, without stirring out for six months, and even in summer they take no delight to be abroad in the day, so that the most proper time to take them is in the night. They are very frequent in all our fresh water ponds, ditches, and rivers. Mr. Pennant says, it is the most universal fish: it lives a considerable time out of the water, and is so tenacious of life, that its parts will move a long while after they are cut in pieces. Common eels grow to a large size, sometimes weighing fifteen or twenty pounds, but this is extremely rare. Mr. Dale, indeed, in the Philos. Trans., and some others, bring instances of eels much exceeding this size; but Mr. Pennant supposes them to have been *congers*, since the enormous fish they describe have been all taken at the mouth of the Thames, the Medway, and other salt-water rivers. The conger, or conger-eel, which is a sea-fish, grows to a vast size. Dr. Borlase informs us, that they are sometimes taken near Mount's Bay of 100lbs. weight; and Mr. Pennant assures us he has heard of some taken near Scarborough, that were ten feet and a half long, and eighteen inches in circumference in the thickest part. They differ from the common eel in many particulars. Innumerable quantities of what are supposed to be their fry come up the Severn about the month of April. They are called *elvers*. They swarm during their season, and are taken in a kind of sieve made of hair-cloth, fixed to a long pole; the fisherman, standing on the edge of the water during the flow of the tide, puts in his net as far as he can reach, and drawing it out again takes multitudes at every sweep, and will take as many during one tide, as will fill a bushel. They are dressed, and by some esteemed; but we think them very indifferent food. Congers are extremely voracious, preying on other fish, and on crabs, at the time they have lost their shell, and are in a soft state. These fish are an article of commerce in Cornwall; numbers are taken on that coast, and exported to Spain and Portugal, particularly, to Barcelona. They are chiefly caught by bulters, which are strong lines, three hundred feet long, with sixty hooks, each eight feet asunder. Sometimes such a number of these are tied together as will reach a mile.

TORTOISE.—Before quitting the aquatic animals, we may just notice that amphibious reptile the sea-tortoise, or turtle, which is found in the West Indies and the South Seas. There are many species, principally distinguished by the peculiarities of their feet. It has four legs and a tail, and the body is covered with so strong a shell, that several men may stand on it without doing it any injury. The tortoise digs round holes in the sand, in which it lays several membranaceous eggs. Some of the species, such as the common *green turtle*, and the *hawksbill turtle*, grow to a very large size, and are not unusually four, five, or six hundred pounds weight. Those who take them watch them from their nests on shore, in moon-light nights; and before they reach the sea, turn them on their backs, and leave them till morning, for they are utterly unable to recover their former position; at other times they hunt them in boats with a spear, striking them with it through the shell; and as there is a cord fastened to the spear, they are taken much in the same manner as whales. Tortoises will live after being deprived of the brain, and even their heads.

The flesh of many of the sea-turtles is highly esteemed as food; that of the hawksbill turtle is, however, indifferent; this species is noticed chiefly as producing the *tortoise-shell* of commerce, so well known and used for various purposes.

SEALS are found most abundantly in cold climates, but that species called the *sea-calf* is a native of this country, and common to most sea-coasts. They are the only quadrupeds that inhabit the Caspian Sea; but they are there in such number as to afford the means of subsistence to many people in that country. They crawl by means of their fore feet upon the land, where the fishermen kill them with long clubs. When one is being killed, several others run to protect it, but in reality only to suffer the same fate. They are exceedingly tenacious of life, and endure many hard blows before they die; some will even live many days after having received several mortal wounds. When these animals are fat, they look like oil-bags, rather than living beings. The skins of seals are particularly useful to trunk makers; a considerable quantity of leather is also made from them. Seals have been trained to follow a boat in the water like a dog. The flesh of the seal is sometimes eaten, but its value consists chiefly in its oil and skin.

WHALE.—The whale, of which there are several species, is the largest of all animals; it is sometimes ninety feet long, and those of the torrid zone are said to be much larger. The head is about one third the length of the whole fish; the under lip is much broader than the upper. The tongue is a spongy, fat substance, sometimes yielding five or six barrels of oil. The gullet or swallow of the whale, in some species, is very small for so large an animal; it does not exceed four inches in width: but it is proportioned to the food it eats, which is said to be a particular kind of small snail; or, as some say, it varies its repast with the medusa, or sea-blubber, an animal which is found in the sea. The whale has two orifices in the middle of the head, through which it spouts water to a great height, and sometimes with a noise like thunder. Its eyes are not larger than those of an ox, and placed at a great distance from each other. Under the skin the whale is covered with fat or blubber, from six to twelve inches thick, which sometimes yields from one to two hundred barrels of oil. The flesh is red and coarse, somewhat like beef. The Greenlanders eat it, and the Icelanders soak it in sour whey. Whales, which produce the well-known article of *whale bone*, are chiefly caught in the North seas; the largest sort about Greenland or Spitzbergen. At the first discovery of that country, and at the beginning of this fishery, they took nothing but the pure oil and the whalebone, and all the business was executed in the country; by which means a ship could bring home the product of many more whales than she can at present, as it is now conducted. The fishery begins in May, and continues all June and July; but whether the ships have good or bad success, they must come away, and get clear of the ice by the end of August; so that in the month of September, at farthest, they may be expected home: but a ship that meets with a fortunate and early fishery in May can return in June or July. Every ship is provided with six boats, and to each boat belong six men for rowing, and a harpooner. Two of these boats are kept constantly on the watch, at some distance from the ship; and when a whale is perceived, they pursue it, and as soon as either of them comes up, the harpooner strikes it with his harpoon. The whale

being struck, the men immediately set up one of their oars in the middle of the boat. On perceiving this, the men on the watch alarm all the rest by the cry of *fall, fall*, and the other boats go immediately to the assistance of the first. The whale, finding itself wounded, runs off with prodigious violence, sometimes horizontally, at others descending perpendicularly. The rope which is fastened to the harpoon is about two hundred fathoms long. The velocity with which the whale draws it over the sides of the boat is so great, that it is wetted to prevent its taking fire. The fishermen find it necessary to let go the rope for a time, till the whale is spent, otherwise its violence would sink the boat. The whale soon however comes up, for it cannot stay long below water, and being now fatigued and wounded, stays above longer than usual. It is now struck again with a harpoon, and again descends, but with less force; when it comes up again, it is generally incapable of descending, but suffers itself to be wounded and killed with long lances, with which the men are provided. It is known to be near death when it spouts up the water deeply tinged with blood. The whale being dispatched, the body floats; the fins and tail are now cut off, and it is drawn to the vessel; the blubber or fat is next cut off, and the whalebone cut off from the upper jaw; the fat and the bone being all which is wanted, the remains of the whale are left. When the ship is thus sufficiently laden, it sails homewards, during which voyage the fat is melted down into oil. One of the largest fish will fill more than seventy butts. The produce of a large whale is valued at about a thousand pounds.

A considerable whale fishery is also carried on in the *South Seas;* here the object of the fisherman is the *spermaceti whale*, which produces not only a much more valuable oil than the preceding, but also the peculiar substance called *spermaceti*, for an account of which see under our head MEDICINES. The spermaceti whale is not, in general, so large as the preceding; but it is, nevertheless, a much more voracious animal: for while the whale caught in the North seas has a very small throat; the spermaceti whale, on the contrary, has a throat which admits fish into it eight or nine feet long. The oil of this species is the spermaceti oil of the shops; the *spermaceti* is separated occasionally from the oil, but the chief source whence it is obtained is the brain of the animal. Spermaceti whales are from sixty to seventy feet long.

The largest whales of the first kind are those found about Spitzbergen; some of them, it is said, 100 feet long; those found in more temperate latitudes are much smaller; those in the Mediterranean the smallest of all.

BIRDS.

Under this head such birds will be chiefly noticed as are most useful to men as aliment: and first of the

SWAN. No bird, perhaps, makes so inelegant a figure out of the water, or has the command of such beautiful attitudes on it, as the swan. Almost every poet has taken notice of it; but none with that justice of description, in so picturesque a manner as Milton.

> " ——— the swan, with arched neck
> Between her white wings mantling, proudly rows
> Her state with oary feet. PAR. LOST, *Book* vii."

In ancient times, it was served up at every great feast, when the elegance of the table was measured by the size and quantity of the good cheer. Swans were formerly held in such great esteem in England, that by an act of Edward IV. no one, who did not possess a freehold of the clear yearly value of five marks, was permitted to keep any. Though at present they are not so highly valued as a delicacy, yet great numbers are preserved for their beauty. The swan is found wild in Russia and Siberia : those about the southern part of the Caspian Sea are very large, and much esteemed for the use of the table. By the Mohammedans the swan is held in high veneration. It is a very strong bird, and sometimes exceedingly fierce, and has been known to throw down youths, and trample them under feet, and even to break the leg of a man with the stroke of its wings. It is said to be very long lived, and frequently to arrive at the hundredth year. It lays eight eggs, and sits six weeks. It feeds on both fish and herbage. It was the popular opinion among the ancients, that the swan foretold his end, and that he sang more sweetly at the approach of death ; the truth however is, that when one of a flock of wild swans happens to be destroyed, they utter a melancholy sound. The ancients ascribe to the swan the powers of melody, hence Virgil :—

"Vare, tuum nomen,———
Cantantes sublime ferent ad sidera cygni. Ecl. ix."

But when he lays aside figure and fiction, he gives him his real note :—

"Dant sonitum rauci per stagna loquacia cygni. Æn. *Lib.* ix."

Young swans are called *cygnets ;* the flesh of swans is said to be wholesome ; that of the cygnet only is now eaten. *Swan's down* is well known ; of it, and other down from similar birds, are made our down beds.

In hard winters wild swans visit our coasts in large flocks, but do not breed in Great Britain.

From the whiteness of this bird, the phrase ' a black swan' was formerly a proverbial expression for a nonentity : but our acquaintance with New South Wales has brought to our knowledge a species of swan, which is entirely black, except the primary and secondary feathers of the wings, which are *white*, and the bill, which is *red*.

The *Swan Goose* is sufficiently common in England, and readily mixes with the common goose ; the breed uniting as freely and continuing to produce as certainly, as if no such mixture had taken place.

The GOOSE breeds commonly once a year, but will frequently have two broods in a season, if well kept. The time of sitting is about thirty days. It is said to live very long, sometimes 100 years. *Wild* geese are common in the winter in this country ; but their flesh is not considered so delicate as that of the *wild* duck.

The *Bean goose* is two feet seven inches in length. This species arrives in Lincolnshire in autumn. They never breed in the fens, but all disappear in May. They retreat to the sequestered wilds of the north of Europe. The *barnacles* appear in vast flocks during winter on the north-west coasts of this kingdom ; they are very shy and

wild; but on being taken, grow in a few days as familiar as our tame geese. They quit our shores in February, and retire as far as Lapland and Greenland to breed. The *snow geese* are very numerous about Hudson's Bay. They visit the Severn river in May, and stay a fortnight; but go farther north to breed. There are many other kinds that migrate.

DUCK. There are two sorts of duck with us, the *wild* and the *tame*, of which there are different varieties.

The *Mallard*, or wild duck, frequents the lakes of different countries, and feeds upon frogs and several sorts of insects. The wild ducks pair in the spring, build their nests among rushes near the water, and lay from ten to sixteen eggs. The female is a very artful bird, and does not always make the nest close to the water, but frequently at a good distance from it; in which case she will carry the young to it in her beak, or between her legs. At moulting time, when they cannot fly, they are caught in great numbers. They abound particularly in Lincolnshire, the great magazine of wild fowl in this kingdom, where prodigious numbers are annually taken in decoys. There are various means used to catch wild ducks and geese, of which one seems worth mentioning. The person wishing to take these, wades into the water up to the chin, and, having his head covered with a calabash, approaches the place where the ducks are; when they, not regarding an object of this sort, suffer the man freely to mix with the flock; after this he has only to pull them by the legs into the water, one after the other, till he is satisfied; returning as unsuspected by the remainder, as when he first came among them. This method is frequently put in practice on the river Ganges, using the earthen vessels of the Gentoos, instead of the calabashes; these vessels are what the Gentoos boil their rice in, and after being once used they consider them defiled, and throw them into the river as useless. The ducks seeing the vessels float down the stream, look upon them with disregard, and the duck-takers find them, on this account, convenient for their purpose.

TEAL. The *common teal* is of a small size, about fourteen inches in length, and is common in our markets. The flesh is accounted excellent. The Chinese teal is a very singular and elegant species, and kept in China and Japan for the sake of its beauty. Attempts have been made, though without success, to breed it in this country. The English in China give it the name of Mandarin duck. The red-headed *widgeon* frequents the fens in this country in the winter season.

The EIDER DUCK is one of the most curious birds of the duck tribe; it is found in the northern parts of Europe, Asia, and America; it is plentiful in Scotland, particularly in the Western isles, and on Farn Islands on the coast of Northumberland. It is twenty-two inches long. The male is white above, but black beneath and behind; the female is greenish. The eggs, five in number, somewhat less than those of a goose, and greenish, are laid in a nest strewed with the down taken chiefly from the breast of the bird; the flesh and eggs are good. This is a very long lived bird; it has been observed to occupy the same nest twenty years successively. The *down* is the lightest and warmest known; that termed live down, and found in the nest, is most valued. *Eider down* is imported from Iceland and other northern countries, where it is collected from the nest of the

bird; if the nest be deprived of its down, the female takes a fresh quantity from her breast; but if the nest be a *second* time deprived of its down, the *male* supplies the necessary lining.

PARTRIDGE. This is so valuable a bird for the table, that sportsmen have invented many ways of taking it. Partridges delight mostly in corn fields, especially while the corn grows; for under its cover they shelter and breed; and when the corn is cut down, they find subsistence among the stubble. The partridge seems to be a bird well known all over the world, as it is found in every country and every climate; as well in the frozen regions about the pole, as the torrid tracts under the equator. It even seems to adapt itself to the nature of the climate where it resides. In Greenland the partridge, which is brown in summer, takes another covering in winter, suited to the season; it is then clothed with a warm down beneath, and its outward plumage assumes the colour of the snow, among which it seeks its food. They are extremely easy to take in nets, and are occasionally taken with bird-lime. The dog, as every one knows, is trained to this exercise; he is taught to lie down at the word of command, he is brought into the field, seeks for his game, and having found it, crouches down or stands immoveable till the sportsmen have come up, who immediately drag the net over the birds. A covey thus caught are sometimes fed in a place proper for their reception: but they can never be thoroughly tamed like our domestic poultry. This mode of taking them is much less common than formerly, the sportsmen generally shooting them on the wing, after the pointer has found them, and the covey is sprung.

The QUAIL is not above half the size of the partridge, but resembles it in shape; and is like all the poultry kind in its habits and nature. The quail is known to be a bird of passage; and yet if we consider its heavy manner of flying, and its scantiness of plumage, we shall be surprised how a bird so apparently ill qualified for migration should take such extensive journeys. At one season of the year they are fierce and cruel to each other, fighting most desperately. Quail fighting was a favourite amusement among the Athenians. They abstained from the flesh of this bird; deeming it unwholesome, as supposing it fed upon the white hellebore: but they reared great numbers for the pleasure of seeing them fight; and staked great sums of money, as we do with game cocks, upon the success of the combats. Fashion has however changed with regard to this bird; we take no pleasure in its courage, but its flesh is considered as a very great delicacy.

PIGEONS are too well known to need description. The domestic pigeon is, by the most recent information, said to be derived from the *rock dove*, or *white rumped pigeon*, a *wild pigeon* found on many of the rocky cliffs of the Mediterranean, and also in Africa, South Wales, and in the Orkneys. It breeds in a wild state only two or three times a-year; the increased fecundity of the common pigeon being produced by domestication. The swiftness of flight of pigeons is well known; and the certainty with which they will return from a great distance to their customary abode is not less surprising.

COCK. No animal in the world has greater courage than the common domestic cock, when opposed to one of his own species; and in every part of the world, where refinement and polished manners have not entirely taken place, cock-fighting is a principal diversion.

With us it is declining every day, and it is hoped it will in time wholly cease. A cock in three or four years becomes weak, and grows old. A domestic hen will lay above two hundred eggs in the year, provided she be well fed, and supplied with water and liberty. If the hen be left entirely to herself, she seldom lays more than fifteen eggs in the same nest without attempting to hatch them; but, if eggs only be desired, they should be removed, one only being left, and she will continue to lay for a long time. When the hen begins to sit, nothing can exceed her perseverance and patience; she continues for some days immoveable, and when forced away by the importunities of hunger, she quickly returns. While the hen sits, she carefully turns her eggs, till at length, in about three weeks, the young brood begin to give signs of a desire to burst their confinement. When all are produced, she leads them forth to provide for themselves. Her affection and pride seem then to alter her very nature, and correct her imperfections. No longer voracious and cowardly, she abstains from all food that her young can swallow, and flies boldly at every creature that she thinks is likely to do them mischief.

GUINEA-HEN, or *Gallina*, is a bird now well known in this country; it is a native of Africa and America. The flesh is delicious; it requires great care in being reared in this climate; a good common hen will get out its chicken much better than the Guinea-hen herself; and to common hens in this country should the eggs of the Guinea-hen always be entrusted. The Guinea-hen does not conform to climate like many other birds; it lays its eggs on the bare ground, and after the young are hatched, it greatly neglects them; not so the common hen, she will be as careful of them as of those of her own species. This bird will lay many eggs; they are extremely small for the size of the bird; much less than a pullet's egg.

PHEASANT. Next to the peacock, pheasants are the most beautiful birds; and though so beautiful to the eye, are not less delicate when dressed. Their flesh is considered as the greatest dainty. In the woods the hen pheasant lays eighteen or twenty eggs in a season, but in a domestic state seldom above ten, and on every account the pheasant seems better left at large in the woods, than brought into captivity. Pheasants were first brought into Europe from Colchis. They eat corn and various insects. Young pheasants prey upon ants. The pheasant is an extremely timorous bird, and of a sullen disposition. Its haunts are usually dry coppices and woods. The times of its coming out are in the morning soon after sunrise, at noon, and at sunset. The young ones will be seen following the female just as a brood of chickens follow the hen.

The HERON builds in cliffs over the sea; though sometimes the nests will be found in numbers on high trees; in this state they are called *heronies*. This bird was formerly much esteemed as food; it is remarkably long-lived, sometimes exceeding even sixty years. It is a great devourer of fish, and does more mischief to a pond than even an otter. It has been found that a heron will eat fifty moderate sized dace and roaches in a day; and that in carp ponds, visited by this bird, one heron will eat up a thousand store carp in a year, and will hunt them so close as to let very few escape.

BITTERN is the name of a bird of the heron kind. It builds on the ground, and lays five or six eggs, which are roundish and of a greenish white. When wounded and going to be taken, it strikes at the

person's eyes, and ought carefully to be guarded against. This bird utters a peculiar sound termed *booming*. The flesh is good.

The PEACOCK is a genus belonging to the order *gallinæ.*—The common peacock is a native of India, and is still found wild in Ceylon and Java. So beautiful a bird could not long be permitted to be a stranger in more distant parts; for so early as the days of Solomon, apes and peacocks were imported in the Tarshish navies. Ælian relates, that they were held in such high esteem in Greece, that a male and female were valued at Athens at one hundred drachms, or thirty-two pounds five shillings and tenpence. At Samos they were preserved about the temple as sacred to the goddess Juno. Alexander found great numbers of wild ones in India, and was so struck with their beauty, as to appoint a severe punishment for any person that killed them. The female lays five eggs, and is particularly solicitous to conceal them from the male, who sometimes destroys them. The Romans considered them as great luxuries, and the young ones are now regarded as a delicacy. The peacock is so well known, that it is scarcely necessary to say, the head is covered with feathers which bend backwards; the feathers of the tail are very long and beautifully variegated, with eyes of different colours. Notwithstanding the beautiful colours of this bird, the *noises* which it makes are most discordant and harsh.

GROUSE, WOODCOCKS, SNIPES, &c., are all delicate-tasted birds. The woodcock is a bird of passage, but snipes are common in marshes. Grouse are found on mountainous moors, and in heathy regions; they are of different kinds, *red grouse* and *black grouse;* there is also a larger kind of grouse, but more scarce, called *wood grouse*, nearly as large as a turkey, seen occasionally in Scotland.

The BUSTARD is too important a bird to be wholly omitted in a work of this nature. It is the largest of our British birds, and is said to weigh occasionally as much as thirty pounds. It was formerly more common in this country than it now is; at present it is only known to breed in the open parts of Suffolk and Norfolk. It flies heavily, but runs swiftly; it used to be hunted with dogs. It only lays two eggs. Its flesh is much esteemed. It has been occasionally domesticated; but, we believe, with little success.

The preceding birds afford more or less useful aliment to man; the following, although rarely, if ever, used as food, nevertheless require some notice.

The most striking genus of rapacious birds is that denominated by Linnæus and many other naturalists FALCO; it consists of above two hundred species; and it should be noted, that in all this tribe the *female* is larger than the male.

The FALCON, or *Falco communis*, consists of above ten varieties; its usual length is about eighteen inches; this bird was formerly much used in *hawking*. It is very voracious, and will live on fish, flesh, or reptiles. It is found in almost all climates except very cold ones.

The EAGLE belongs to the falcon genus, and takes the precedence among birds, as the lion among quadrupeds, from its strength, activity, and courage. Eagles often soar beyond the reach of the human eye; but, though unseen, their sounds are heard with considerable distinctness, and have been compared to the barking of the dog. The *golden eagle* measures above three feet in length, and eight in breadth, and weighs about sixteen pounds. This bird has been known to breed

in the highest mountains of Wales, and among the Chevoit hills; and not unfrequently in the mountainous districts of the sister island.

The BALD EAGLE is found in Europe, but more frequently in North America; it lives on fish as well as flesh. The singular manner in which it sometimes procures the former deserves notice: fixing on some convenient situation open to the water, it watches, with its intensely observant eye, the motions of the *osprey;* as soon as it perceives this bird bearing off a fish in its mouth, the bald eagle pursues it with the swiftness of a meteor; the fish is instantly dropped from the mouth of the osprey, and in its fall intercepted by the eagle with the most energetic and successful dexterity.

The SEA EAGLE or *osprey* is found in many countries both of Europe and America; its sight is said to be equally clear by night as by day; it is nearly the size of the golden eagle; it subsists principally on fish.

The KITE is migratory in various parts of Europe; in England it is said to continue the whole year. It preys chiefly upon small birds, and from a distance in the air, at which it is invisible to the sight of man, it will pounce on them with incredible rapidity and [fatal precision. It makes frequent depredations on broods of young chickens, and furnishes hereby an interesting spectacle of maternal affection and courage in the hen. From these conflicts the kite sometimes retires worsted.

The HAWK tribe consists of a numerous subdivision of the *falcon* genus of birds; among these

The KESTRIL, *hawk,* or *hover hawk,* is one of the most common, and perhaps the most useful of all the tribe of falcons. It is seen almost every where in this country, hovering about in our fields, and then suddenly dropping down upon its prey, which consists for the most part of mice.

The GOSHAWK is larger than the kestril; it feeds on mice and small birds, which last it plucks before it devours them, with great dexterity and neatness. This bird was formerly in high estimation, when the diversion of falcony prevailed in this country, to which it was trained by discipline, to the most accurate obedience to its keeper. It is now rarely seen in England; in Scotland it is comparatively frequent; and in France and Germany, Siberia and North America, it is far from uncommon.

The CONDOR belongs to the *vulturine* class of birds, and is the largest of the birds of flight; it is said to measure with the wings extended fourteen, sixteen, or even more feet; but Mr. Barrow wounded a condor at the Cape of Good Hope, which measured ten feet and one inch; the colours of this bird are black or brown mingled with white; its bill is four inches long; its legs and claws are large and stout. It is said to build under the protection of the highest rocks. It frequents the desert mountains; and is occasionally seen on the Andes in South America. It preys mostly, if not entirely, on dead carcasses, as most of the vulture tribe are known to do; and are therefore in warm climates, where chiefly they are found, a very useful tribe of animals.

It would give us great pleasure, further to detail some of the immense variety of birds with which creation abounds. The limits of our work, however, forbid this. The reader will find ample gratifica-

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tion in the pleasing study of ornithology, in numerous works published professedly on this subject.

Medicines, &c.

It is fortunate for mankind, that there exists a disposition in our natures to communicate to each other the best method of alleviating pain: hence the mass of information which has been made public concerning the curing of diseases. And although a good deal of what is stated in books cannot implicitly be relied on, yet much of considerable importance to us may nevertheless be obtained. In the short space to which we are necessarily restricted we shall not be able to notice a great many of the articles which have obtained celebrity as remedies for disease; we will nevertheless endeavour to sketch, in as concise a way as possible, the principle on which it appears to us the healing art chiefly depends.

For the greater convenience of the reader we shall divide this portion of our volume into three sections: first, those medicines derived from the *vegetable* kingdom, next those from the *animal*, and lastly those from *earths* and the *mineral* kingdom.

MEDICINES OBTAINED FROM THE VEGETABLE KINGDOM.

OPIUM is a gummy, narcotic juice, obtained from the unripe head of the white poppy, and afterwards inspissated, or thickened. This juice flows out of itself through incisions made in the poppy heads for the purpose. The best opium comes from Turkey; an inferior sort is brought from the East Indies. That from Turkey is in roundish lumps covered with leaves to prevent their sticking together. It should be chosen dry and of a dark brown colour; its smell should approach as near as possible to that of the juice of the white poppy when hardened by the sun and air. The juice, when it runs from the poppy head, is of a milky white; as it dries it becomes of a brown colour. Opium has been lately obtained, of fine quality, from poppy heads growing in this country. The tincture of opium, generally called *laudanum*, is the most general form in which it is administered. It is also given in pills: one grain is generally considered a dose. It is given in innumerable complaints. Its chief uses, however, are to soothe pain, to produce sleep, to stop vomiting, to allay irritability, and to correct violent discharges by the bowels.

PERUVIAN BARK, *Jesuits Bark*, or *Cinchona*, is obtained from several species of a genus of trees growing in the East and West Indies and South America. Three kinds of Peruvian bark are found in the shops; the *yellow bark* is obtained from the *lance-leaved Cinchona*, growing in Peru; the *red bark* is obtained from the *oblong-leaved Cinchona*, growing in the woods of the Andes; and the *heart-leaved Cinchona*, found on the mountains of Quito, produces the *pale bark* of the shops. The medicinal powers of all these are very similar. The yellow bark, which was last introduced into medicinal practice, is now very generally preferred. Bark has been employed as a medicine in Europe for more than a century. At its first introduction it is said that it was sold at eight shillings a dose. The name of *Cinchona* has been given to this medicine, after the *Countess del Cinchon*, wife of a viceroy of Peru, whom an Indian of Loxa cured of an inter-

mittent by its means, in 1638. After this, Father de Lugo brought some of it to Rome; thence it spread into France and England, and is now, by way of eminence, called the *Bark*. It is given in numerous complaints in which strengthening or tonic medicines are required. In the cure of *agues*, indeed, it is considered almost a specific. Notwithstanding the great value of this medicine, and its numerous preparations of tinctures, extracts, and powder, modern art has lately invented another form of administering what may be considered its *essence*, in combination with the sulphuric acid, under the name of

QUININE, or rather, *sulphate of Quinine;* a few grains of which are found of more efficacy than drachms of any of its other preparations. Quinine is in the form of a white powdery saline substance, having a considerable affinity in taste to the bark itself, but affecting the tongue much more intensely than that substance. It is given in the ague districts of this country with much success; it is also administered as a useful tonic on many other occasions.

ALOES; an inspissated juice obtained from different plants of the aloe tribes. The aloes found in the shops are usually four; namely, the *Socotrine*, the *Hepatic*, the *Cape*, and the *Barbadoes:* these last are sometimes called *horse* aloes, as to the horse, from their activity, they are usually given. The *Socotrine* aloes, which are the best, are brought from the island of Socotra, but they are a scarce article: their place is more commonly supplied by hepatic aloes, which are brought from the East Indies, or by a mixture of one part Cape and two parts hepatic aloes dissolved in water, strained, and the water evaporated by boiling, till the aloes become hard. *Cape* aloes are brought from the Cape of *Good Hope*. Aloes combined with soap, colocynth, or scammony, as the case may be, form, as a purgative, one of the most valuable medicines of the materia medica. In obstinate costiveness and hypochondriacal complaints they are invaluable, but they sometimes produce the piles. *Barbadoes* aloes come from the island of that name.

IPECACUANHA is a small wreathed root obtained from a perennial plant growing in the forests of Brazil. Its use as a medicine is chiefly as an *emetic;* but it is also very useful, when given in small doses, as a diaphoretic, expectorant, and stomachic. The emetic properties of this root have been found to depend upon a peculiar substance which has been separated from it and called *emetine*. Several sorts of ipecacuanha are met with in the shops; the best is greyish, wrinkled, and of a small size; the brown and larger roots are not so good.

RHUBARB. Two kinds are met with in the shops. *Russia* or *Turkey* rhubarb is in small pieces with a hole cut through each: it is of a yellowish marbled colour. *India* rhubarb is in larger pieces, more compact, and generally of a darker colour. But perhaps for medicinal use this last, although much cheaper, is equal if not superior to the former, which is brought from Russia and Turkey, the latter from the East Indies. Rhubarb is the dried root of a plant having an annual stalk, but the root itself is perennial. It is propagated in most of our gardens, and the stalks of the leaves are well known as furnishing us with a pleasant pie. The root is occasionally dried in this country, and has been given, it is said, with the same success as the foreign article; but the prejudices against it are so great that very little of it is sold. It is propagated from seed. Rhubarb is a useful purgative for children, and on some occasions for the adult; but we believe its

medical properties have been too often overrated. It appears to be most powerful when given in substance.

COLOCYNTH, or *Bitter Apple*, is the fruit of an annual plant of the cucumber genus, native of Turkey; it is a dry round berry about the size of an orange; it contains a white pulp with many seeds; it has no smell; the pulp is a very powerful cathartic; it is rarely, however, given alone: combined with aloes and scammony it forms one of the best cathartic medicines known under the name of *compound extract of colocynth.* The *pill of coccia,* of the shops, is made of similar ingredients.

ELATERIUM is a feculent matter obtained from the juice of the wild cucumber, *momordica elaterium,* a perennial plant, native of the south of Europe. Elaterium is a useful and most powerful purgative, particularly in dropsical complaints; its administration, however, requires great skill; three grains are a full dose, but it is more frequently given in half grain doses every hour, till it operates.

SCAMMONY is a gum resin obtained from the root of a species of bind-weed, the *convolvulus scammonia,* growing in Syria. It is obtained by cutting off the root just below where the stalks spring out; a milky juice exudes, which is collected in a shell; a few drachms only are produced from each root. The best scammony comes from Aleppo, an inferior sort from Smyrna. Aleppo scammony is of a dark shining resinous fracture, and on the outside of a greyish colour. Smyrna scammony is nearly black, hard and heavy, and does not shine much, if at all, when broken. Scammony is a drastic cathartic, operating in general both quickly and powerfully. For hypochondriasis, worms, and dropsy, it is a valuable medicine; it is, however, more frequently given with colocynth and aloes than alone.

TURPENTINE. A resinous exudation from several different species of the fir or pine genus. It is sometimes a spontaneous product; but more frequently obtained by art, by making incisions in the trees. Turpentine is found in the shops as, *common,* or *horse, Venice,* and *Chio turpentine.* Horse turpentine is of a yellowish colour, and about the consistence of honey. It is sold, as being the turpentine obtained from the pine, freed from its impurities; but there is reason for believing that it contains a portion of some fixed oil. *Venice turpentine,* although presumed to be imported from Venice, is usually made by a mixture of black resin and oil of turpentine; sometimes with also a certain portion of linseed oil. *Chio turpentine* is brought from the island of Chios, whose name it bears. Crude or unstrained turpentine is brought to this country from various places, chiefly, at the present time, from America. This crude or unstrained turpentine, when hardened by age, is the *frankincense* of the shops. Raw turpentine is occasionally used medicinally; but the *oil,* or, as it is commonly called, the *spirits of turpentine,* is of more importance both as a medicine and in the arts. It is distilled from the raw turpentine, the remainder left in the still being *yellow resin,* so universally known; *black resin* is yellow resin still further deprived of its terebinthine qualities. *Oil of turpentine* is a good diuretic; and, in large doses, is an excellent remedy for the tape-worm. Horse turpentine is a good detergent, and is frequently an ingredient in ointments; it is also occasionally useful, externally applied, for pains in the limbs. *Yellow resin* is used for a variety of purposes in the arts, and occasionally in ointments. It is one of the ingredients of yellow soap. Shoemaker's

wax is made of resin and pitch, and sometimes grease, melted together.

TAR is obtained from the wood and roots of various kinds of pine by the agency of fire; it is too well known to need description; that which is thinnest and blackest is the best. The mode of making tar in Sweden is as follows: a conical cavity is made in the ground, generally in the side of a bank or sloping hill; the roots, as well as billets and logs of the fir, are packed into the cavity, when the whole is covered with turf, which is beaten down firmly upon the wood. The fir is then kindled, and a slow combustion takes place without flame. The tar exudes into a cast-iron pan, at the bottom of the funnel, having a spout, beneath which barrels are placed to receive the tar. This process is the same, in fact, as that described by Theophrastus and Dioscorides, as practised by the ancient Greeks. Tar is made in France and Switzerland in ovens built for the purpose. Tar is used in medicine; and for innumerable purposes in the arts.

In the preparation of tar *charcoal* is necessarily produced; and although LAMPBLACK is now obtained by a different process in this country, namely, the consumption of the refuse of turpentine works; yet it is said in other countries, and formerly, that lampblack was obtained at the same time that the tar and charcoal were prepared in ovens specially constructed for the purpose.

PITCH is merely an inspissated tar; the more volatile parts of which are usually drawn off by distillation; these are commonly sold under the name of *oil of tar*. The best pitch is said to be imported from Norway and Sweden. Pitch is occasionally used as an ingredient in plasters, and sometimes alone; its chief use is, however, to preserve wood from the weather, and for imparting a greater consistency to tar for the same purpose.

BURGUNDY PITCH is said to be the produce of the *pinus abies*, by making incisions in the wood; the juice concretes in the form of flakes, which are removed from the tree, and after being melted with water and strained through coarse cloths, is brought to this country from the neighbourhood of Neufchatel. A factitious sort is made in England. True Burgundy pitch is of a reddish brown colour and less friable than the factitious; it is a useful external application, being spread upon leather as a plaster.

FRANKINCENSE, as we have seen in a preceding article, is the crude turpentine just as it is imported into this country, and merely hardened by age; it is of course in no ways different from that article; and such is it found in the shops. The ancients, however, gave the name of Frankincense to a different substance; and it is most probably that found in the shops under the name of *gum olibanum*, the product of the *boswellia serrata*, a native of India. It is in large, pale, yellowish tears, or drops, and of a faint yet agreeable terebinthine odour. It was formerly used medicinally, but is now almost forgotten, the turpentine supplying its place. It is brought to this country from the Levant and India.

Frankincense was formerly burnt in the temples of all religionists to do honour to the divinities which they adored. Many of the primitive Christians were put to death because they would not offer incense to idols. In the Romish church they still retain the use of incense in many of their ceremonies.

JALAP, the root of the *convolvulus jalapa*, a species of bind weed growing in South America. *Jalap* is said to be derived from *Xalapa*, a town of Mexico, in the environs of which it is reported to grow plentifully. The plant resembles the bind-weed of our hedges. The root, the best of which comes from Vera Cruz, is generally cut in transverse pieces; but it is also occasionally found in egg-shaped tubers. It is of a dirty brown colour; the powder is pale brown; it has a peculiar odour and a slightly acidulous pungent taste. Jalap is an active purgative and is esteemed particularly serviceable in dropsy.

CAMPHOR, or *Camphire*, is a white, solid semi-transparent substance, having a strong peculiar fragrant odour, and a bitter pungent taste; it dissolves in both the fixed and volatile oils; like these last, it is volatile, inflammable, soluble in alcohol, and sparingly soluble in water. Camphor is found in many vegetable substances, but the camphor of commerce is obtained from a tree, the *dryobalanops camphora*, growing in some of the East India islands; it grows to a great height, and the trunk often measures six or seven feet in diameter. The camphor is found in the heart of the tree, occupying portions of a foot, or a foot and a-half long, at certain distances. It is found in a concrete state, in whitish flakes. One tree will sometimes yield from ten to twenty pounds. It is also obtained from the wood, which is cut into chips, and submitted to a kind of distillation. It is brought to this country in granular friable masses of a dirty-white colour; here it is *refined*, that is, separated from its impurities by sublimation; hence it is in the circular cakes, with holes in the middle, in which we see it in the shops in the large way in this country.

Camphor is stimulant, narcotic, and diaphoretic; it is considered a good cordial medicine in a variety of complaints. It is also used externally in many liniments and lotions. Its use in the arts is also of some importance; it is the ingredient in sealing-wax which causes the wax to burn. Camphor may be obtained from many of our aromatic plants, such as peppermint, lavender, rosemary, &c. Crude camphor is brought to this country from the islands of Sumatra and Borneo. It is said that it is the old trees only which yield the camphor, which in young trees is in the shape of an oily juice.

GINGER is the root of a species of *amomum*, a native of the East Indies, but now naturalized in the West Indies, whence we are chiefly supplied with it. The ginger plant is said to resemble our rush in flower and stem, both of which are annual, but the root is perennial. The different kinds of ginger found in the shops appear to be the same root differently dried or otherwise prepared; the roots which are white, soft, and woolly, are in general less pungent than the more solid and compact kinds. Ginger is much employed both as a condiment and as a medicine; it is considered a useful stimulant in dyspepsia, gout, and other complaints requiring exciting medicines. Ginger is brought also to this country preserved in syrup; the Indians, it is said, eat the roots when green as salad.

The CLOVE is obtained from a tree of the same name, a species of *eugenia;* it is somewhat in form of a nail; whence the term *clove* from the French *clou*, a nail. The clove tree was anciently very common in the Molucca islands; at present cloves are chiefly obtained from the island of Amboyna, the Dutch having, from their cupidity, dug up the trees in the other islands. It is now, however, cultivated

in the Isle of France, at Cayenne, and in the island of Dominica in the West Indies. The tree is very large; its bark resembles that of the olive tree, and its leaves those of the laurel; its fruit falling takes root without any culture, and eight years after bears fruit. The clove is the unexpanded flower. At Amboyna, they are collected from October to December, when they begin to redden. They require to be dried quickly; on which account they are first immersed in boiling water, and then exposed to smoke and heat; the drying is afterwards finished in the sun. Although the unopened flowers and even the leaves are extremely aromatic, the real fruit, which is a coriaceous berry, is not so. Cloves are hot, stimulating aromatics, which affect the breath, eyes, and head, and are useful in palsies, &c. There is an oil drawn from cloves by distillation; it is used as a sovereign remedy for the tooth-ache, and in compositions with the same view as the fruit. It is also much used among perfumers. Much, however, of the oil of cloves sold in this country is said to be obtained from allspice.

Another species of the *eugenia* produces the *Malabar plum*, which is eaten both fresh and preserved in sugar.

The NUTMEG is the product of the *myristica moschata*, a tree, native of the Molucca Islands, from which, except Banda, by the policy of the Dutch it has been nearly extirpated; Banda now supplying with mace and nutmegs the whole of Europe. The nutmeg tree rises to the height of thirty feet. The flowers, which are inodorous, are present at the same time with the fruit, and male and female are on the same and on separate trees. Nutmegs are inclosed in four different covers. The first a thick husk, like that of our walnuts. Under this lies a thin reddish coat, of an agreeable smell, and aromatic taste, called *mace*. This wraps up the shell and opens in proportion as the pod grows. The shell, which makes the third cover, is hard, thin, and blackish; under this is a greenish film of no use, and in this is found the nutmeg, which is properly the kernel of the fruit. The nutmeg tree yields three crops annually; the first, which is the best, in April; the second in August, and the third in December. The fruit requires nine months to ripen; when gathered, the outer covering is first stripped off, then the mace carefully separated and dried; the nutmegs in the shell are next exposed to heat and smoke for three months, then broken and the kernels thrown into a strong mixture of lime and water, after which they are cleaned and packed up. This process is said to be necessary for their preservation, and with the same intention the mace is sprinkled with salt water. There are several varieties of this tree, but the queen nutmeg, which bears a round small nut, is the best. The medicinal properties of nutmegs and mace depend chiefly on the essential oil which they contain; both are stimulant, carminative, and in large doses narcotic. As a culinary spice nutmegs are too well known to be described. An essential oil containing the chief properties of the nutmeg, and an expressed oil from it, commonly called oil of mace, are well known in commerce; the last is of very little value.

PEPPER, or rather *Black Pepper*, is well known from its general use. It is the produce of a climbing plant or vine growing in several parts of the East Indies, chiefly Java, Sumatra, Malacca, and the coasts of Malabar. It is propagated in Sumatra by cuttings or suckers; in growing it is supported by props; the plant is three years old before it bears fruit; it yields two crops annually, the first in Decem-

ber, the second in July. *White pepper* is the fruit of the same plant perfectly ripe and freed from its outer coat by means of a preparation of lime and mustard-oil, applied before it is dried.

The uses of black and white pepper as condiments need not be described; as medicines they are stimulants on many occasions. Pepper that is sold ground is apt to be adulterated; but since it has been placed under the supervision of the excise in this country the sophistication has been more difficult.

Long Pepper is so denominated from its form; it consists of an assemblage of grains, closely joined together, and grows by a long pedicle on a plant like that of the black. It is a native of the East Indies; but differs little, if any thing, in its qualities from the common black pepper.

Guinea pepper is the pod of some species of the capsicum. It is extremely hot and pungent, and much esteemed. It is now cultivated in France, and used in flavouring vinegar, and likewise comfited with sugar. It must be chosen fresh, in large pods, dry, entire, and red.

The Cayenne Pepper, or *bird pepper*, brought from the West Indies, is the produce of the *baccatum* and some other species of the capsicum. It is very useful as a condiment, particularly with fish; and latterly it has been introduced into medicine in the shape of a *tincture*, which is a useful stimulant in dyspepsia, &c.

Jamaica Pepper, or *pimenta*, is the fruit of an evergreen-tree, the *myrtus pimenta*, rising sometimes fifty feet in height. It grows plentifully in Jamaica and other American islands. It is aromatic, and may supply the place both of cloves, nutmeg, and cinnamon, whence it is called by the English *all-spice*. The essential oil of pimenta contains the principal virtues of the berry; it is so much like oil of cloves as to be often mistaken and sold for it.

CARAWAY; a well known seed, the produce of a biennial plant, cultivated in this and other European countries; the plant itself has in its leaves much the appearance of a carrot. It is a stimulating condiment, and contains an essential oil which is useful in flatulences and indigestion. The best caraway seeds are raised in England; an inferior kind is brought from abroad.

ANISEEDS, *Cummin seeds*, *Fennel seeds*, and *Coriander seeds*, may also be mentioned as warm stimulants. *Oil of aniseeds* has been indeed long in use in various complaints; it has the peculiar property of congealing in every kind of temperature in this country below that of summer heat.

LINTSEED also deserves mention, as the seed of that useful plant Flax, of which and of its *oil* we shall treat hereafter. Lintseed, however, furnishes a nutritious mucilage by heat, which is valuable in several complaints.

MANNA is a saccharine juice exuding in warm weather from the stem and branches of the *fraxinus ornus*, or flowering ash, which grows abundantly in Calabria, Sicily, and Apulia. This juice, concreting into whitish tears, is scraped off and sold as manna in tears; but the greater part of the manna is obtained by longitudinal incisions made on one side of the tree and continued from the base of the trunk upwards. Manna is obtained in the shops under different names; the best is called *flake* manna, in oblong pieces of a white or pale yellow colour, having the appearance of a concrete sugar, and which indeed it chiefly appears to be. Manna is a weak purgative; it is oc-

casionally given to children; but its medicinal virtues are not of much importance.

SENNA; the leaves of an annual plant, the *cassia senna*, a native of Upper Egypt. Senna is a dried leaf of a yellowish green colour, oval, pointed, and scarcely one inch in length. The best senna is said to grow wild, and yields two crops of leaves, the first is collected about the middle of September, the second the following March. The plants are cut when the flowers begin to fall, and exposed on the rocks to dry in the sun. The leaves are then picked off and packed up in bales, and brought to this country chiefly by way of Alexandria.

Senna is a very useful purgative on a variety of occasions. It is the principal ingredient in *Daffy's Elixir*, a well-known purgative quack medicine.

CASSIA FISTULA, or *Purging Cassia*, is a tree, native of the East, the West Indies, and Egypt. It rises to the height of forty feet. The fruit is a round, long, woody, blackish pod about one inch in diameter, and from one to two feet in length; it is divided into numerous cells, each cell containing one smooth oval seed, embedded in a soft black pulp. This pulp is the part used medicinally; it is gently laxative, and for this purpose is given to women and children. Cassia fistula is imported into this country chiefly if not entirely from the West Indies.

CASSIA, or *Cassia Cinnamon*, is the bark of the *Laurus Cassia*, a species of bay-tree growing in Malabar, Ceylon, Sumatra, and Java. It has many of the habits of the cinnamon-tree, and is barked in the same manner. *Cassia cinnamon* is chiefly distinguishable from the true cinnamon by being of a lighter colour than that article; by being also thicker, by breaking shorter, and by having less bitterness in its taste, as well as very frequently when chewed becoming mucilaginous in the mouth; this last, however, is not an invariable accompaniment.

CASSIA BUDS have the same odour and taste as cinnamon except its astringency. They are of a brown colour, and resemble a nail with a round head. Both the bark, before mentioned, and the buds yield by distillation an essential oil similar to cinnamon; between the oil of cassia and cinnamon there appears to be no real difference. All are useful aromatic stimulants.

CINNAMON is the bark of the *Laurus Cinnamomum*, a tree growing in abundance in the Island of Ceylon, and also in Malabar, Cochin China, Sumatra, and other East India islands. It is also now cultivated in the Brazils, the Mauritius, and Guiana. It seldom rises above thirty feet high. Ten varieties of this tree have been enumerated; of these, that called the *sharp sweet cinnamon* is said to be the best. It is raised from seed. The chief part of the cinnamon in this country is brought from Ceylon. The principal difference between cinnamon and cassia consists in its being much thinner and in more irregular masses, and also in its having much more astringency, and therefore in *substance* is preferable to cassia. The uses of cinnamon as a condiment are too well known to need enumeration. Oil of cinnamon, as well as some of the other aromatic oils, is heavier than water, and consequently sinks in that fluid.

GUMS.—The substances arranged in medicine and the arts under the name of *gum* consist of very different properties, some are pure mucilage, as Gum *Arabic*, *Senegal*, and *Tragacanth;* others are composed

of a mucilage combined with a peculiar resin, hence called *Gum Resins;* such are *Myrrh*, *Asafœtida*, &c. Others again consist wholly of resin, as *Gum Guaiacum.* The gums consisting chiefly of mucilage dissolve wholly or nearly so in water; gum-resins dissolve best in *proof spirit*; and the *resins*, such as guaiacum, require *alcohol* or *rectified spirits of wine* for their solution.

GUM ARABIC is obtained from a tree, the *acacia vera*, growing in various parts of Africa, chiefly in the Atlas mountains. It is almost too well known to need description. If taken as food it is nutritious, consisting simply of mucilage; as medicine it is used on various occasions as a demulcent; its uses in the arts are very various.

GUM SENEGAL is obtained from various trees of the acacia kind, growing in the western parts of Africa, chiefly from Senegal, whence its name. It is in larger lumps than gum arabic, and generally of a redder colour; but its essential properties are not different from that article.

GUM DRAGON, or *Tragacanth*, is the production of a shrub, the *astragalus verus*, a native of Persia. It is of a whitish colour, in thin wrinkled worm-like pieces; it swells and softens in water, but does not readily form a homogeneous fluid with it. It is similar in its medical qualities to gum arabic; it is also of use in the arts.

MYRRH, or *Gum Myrrh*, is obtained from a tree or plant growing in Arabia, Abyssinia, and India, but of what kind, although myrrh has been so long known, we are at the present time totally ignorant. The best myrrh is brought from the Levant, and is called *Turkey myrrh;* an inferior kind is brought from the East Indies. Turkey myrrh is in irregular pieces, many of which are in the shape of tears similar to gum arabic; but myrrh is of a darker hue and more friable than that article. Myrrh is used in medicine as a tincture applied to wounds and diseased gums; and is given internally as a tonic and expectorant. It is an odoriferous gum, and was formerly, it is believed, one of the substances employed by the Egyptians and other nations to embalm dead bodies.

STORAX is a fragrant gum-resin obtained from the *styrax officinale*, a native of Europe and the Levant. Storax is brought to this country from Asiatic Turkey; it issues from incisions made in the bark. It is found in the shops of three kinds, *in the tear*, which is pure storax, a very scarce article; in powdery lumps, which are nothing but a small quantity of the genuine storax mixed with saw-dust; and liquid storax, which is generally a composition of storax, tolu, and benzoin. Storax contains much benzoic acid, and is esteemed stimulant and expectorant. It is used by the perfumers to give to spirit of wine the smell of *jessamine.*

GUM BENJAMIN, or *Benzoin*, is a fragrant resin obtained from the *styrax benzoin*, a native of Sumatra, by wounding the bark near the origin of the lower branches. It is first wounded when six years of age, and continues to yield the gum for about twelve years annually; yielding at each incision about three pounds of resin. It is in large lumps of a marbled appearance, and has a subacid pungent taste. Benzoin is an ingredient in the well-known tincture called *Friar's Balsam.* Its chief use however is for affording the *Flowers of Benjamin*, or *Benzoic Acid*, a peculiar substance existing in many other aromatic resins, such as *Balsam of Peru.* Flowers of Benjamin are used in various

cosmetic preparations, to give a pleasing smell. As medicine they are considered agreeably stimulant.

GUM GUAIACUM is a resin obtained from a tree, the *Guaiacum Officinale*, or Lignum Vitæ, growing in Jamaica and other West India islands. It sometimes exudes spontaneously from the tree; but most of the guaiacum of commerce is obtained either by making incisions into the tree or by sawing the wood into billets; boring a hole longitudinally through them, so that when one end of the billet is laid on the fire, the guaiacum melting runs through the hole from the opposite end, and is collected in a calabash. Guaiacum is a hard dark-coloured resinous mass, which invariably turns green on exposure to air. It is considered a useful stimulant. The *Essence of mustard* sold in the shape of pills, is composed principally if not entirely of this drug.

Guaiacum wood is the well-known Lignum Vitæ, at once hard, heavy, and durable. It is strongly impregnated with the qualities of the gum; its specific gravity is 1.333.

GUM JUNIPER, or *Gum Sandarach*, is a resinous exudation from the *Juniperus communis*, a native of various countries of Europe. It is useful as a varnish, and also is, *in powder*, the substance so well known called *pounce*.

GUM MASTIC is the production of the *Pistacia Lentiscus*. It is brought to this country from the island of Chios. Its medicinal virtues are trifling, but it is used as a varnish; it is occasionally chewed for cleansing the teeth; it is used also as an ingredient in *Eau de Luce*.

GUM AMMONIACUM is a stimulating medicine obtained from a plant growing in Persia. ASAFŒTIDA is a fetid gum, the produce of the root of an umbelliferous plant, the *Ferula Asafœtida*, growing wild in Persia. GALBANUM is obtained from the *Bubon Galbanum*, a perennial plant growing in Syria and Africa. SAGAPENUM is the product of an unknown plant of Persia. OPOPANAX is the produce of a tree, the *Pastinaca Opopanax*, growing in the Levant. All these have smells more or less powerful, and are all used occasionally either internally or externally as medicines. They appear to be very similar in their virtues. *Ammoniacum* and *asafœtida* are more commonly used than the rest, as antispasmodics and expectorants.

DRAGON'S BLOOD is a red resinous exudation obtained by wounding the bark of the *Calamus rotang*, growing in many of the East India islands. It is of a dark red colour, and readily melts and takes fire. It has no smell, but is of a pungent taste; it is of little use in medicine. In the arts it is a useful colouring material. Pliny's account of this gum is fabulous.

BALSAM OF PERU is the product of the *Myroxylon peruiferum*, a tree, native of the warmest parts of South America. It is of the consistence of treacle, of a dark colour, and very aromatic.

BALSAM OF TOLU is obtained from the *Toluifera Balsamum*, a tree, native of South America, growing in the province of Tolu. Both this and the Balsam of Peru are warm stimulating medicines.

BALSAM OF CAPIVI, or COPAIVA, is obtained from the *Copaifera officinalis*, a tree, native of South America. It is an aromatic stimulating medicine; and in its medical properties is very much allied to the turpentines.

BALSAM, or BALM OF GILEAD *Opobalsam*, or *Balsam of Mecca*, is a spontaneous exudation from the *Amyris opobalsamum*, a tree

growing on the Asiatic side of the Red Sea, particularly near Mecca. It is now rarely used. Its qualities appear to be similar to those of Balsam of Tolu, but more stimulating. Its chief use is as a cosmetic.

BALSAM OF CANADA is the product of the *Pinus balsamea*, a pine-tree growing in Canada, whence it is imported into this country. It does not appear to be essentially different from turpentine.

TERRA JAPONICA, JAPAN EARTH, or *Catechu*, is obtained from the *Acacia catechu*, a tree growing plentifully in the mountains of Kahana in Hindostan. It is brought to this country from Bengal and Bombay. Catechu is an *extract*, and not an earth, as from its name it was a long time erroneously supposed to be. It is called in India by the natives *Cutt*, by the English *Cutch*, and by different authors *Khaath*, *Cate*, *Cachou*, *Cachore*, and *Catechu*. It is in small square pieces, of a brownish colour, and so hard as to be readily pulverized. It is a very useful astringent in many complaints ; but its use as a medicine will be, most likely, in time, as it becomes more known, superseded by its use in the arts ; it consisting of about 54 1-2 parts of tannin, 34 of extractive matter, 6 1-2 of mucilage, and only 5 of earth and other impurities. Hence it is presumed to contain the tanning principle in larger proportion than any article at present known in commerce.

CHAMOMILE FLOWERS, the product of the *Anthemis nobilis*, are almost too well known to need description as a useful bitter stomachic, found growing in this country on many of our heaths, such as Blackheath and Epping Forest : it should be mentioned that the *wild* chamomile flower is more powerful than the double flower found in the shops.

RHATANY-ROOT, the product of the *Krameria Triandra*, a native of Peru, although said to have been long held in high estimation by the physicians of Spain, has been but lately introduced into the practice of medicine in this country. In its external appearance it resembles madder-root, but is larger. It has a bitter astringent taste, and in its qualities seems to approach nearer to the Peruvian Bark than any other substance. It is said, however, to be more grateful to the palate and stomach than bark ; and hence many patients have been able to persevere in its use who could not take the bark in any form. Its dose is similar to that medicine. It is believed that the vintners in Portugal have long used it for giving to Port wine that astringency by which it is peculiarly distinguished.

AMBER, called by the ancients *electrum*, is a solid, hard, semi-pellucid substance, possessing a sub-acid resinous taste, and when heated emits a fragrant aromatic smell. It is evidently of vegetable origin, the lumps inclosing, occasionally, pieces of twigs and insects in their substance. It is obtained in many countries. It is dug out of the earth in Prussia, near the sea-coast. It is found on the sea-shore of Polish Prussia and Pomerania, particularly after some tempestuous winds. It is also found sometimes on the eastern coast of Great-Britain, and occasionally in the gravel-pits around London.

The most remarkable property of this substance is, that when rubbed it draws or attracts light bodies to it. By friction it is brought to yield light pretty copiously in the dark. Hence the origin of our terms *electric*, *electricity*, &c. from the word *electrum*. Amber is of two colours, *white* and *yellow*. It was formerly used in a variety of ways

in medicine, but is now in little repute. A volatile salt and a stimulating oil obtained from it are still, however, kept in the shops. The oil is a warm and useful medicine in rheumatic and other complaints. Amber is used in commerce for beads; and for varnish, in a similar way to

Gum Copal, another production, with the origin of which we are wholly unacquainted. Copal, however, affords, when dissolved in a suitable menstruum, the most beautiful varnish known. It is brought from Africa.

We may here cursorily notice a few BARKS that do not seem to demand a separate article. These are *Cascarilla*, the bark of the *Croton Cascarilla*, a tree, native of the West Indies; it is imported chiefly from Eleutheria, one of the Bahamas. It has a pleasant spicy odour, and a warm aromatic taste. It is carminative and tonic. *Angustura Bark* is the product of the *Bonplandia trifoliata*, a native of South America, an elegant evergreen, rising to the height of sixty feet or more. Its medical qualities are stimulant and tonic. *Canella alba* is a hot spicy bark, sometimes erroneously called winter's bark. It is obtained from a tree of the same name, growing in the West Indies. It is chiefly used in the aloetic powder called *Hiera picra*. *Winter's Bark* is obtained from the *Wintera aromatica*, a native of the Straits of Magellan. It is similar in properties to the *Canella alba*. We may add, also, that the barks of *Mezereon*, of *Sassafras*, of the *Oak*, of *Simarouba*, of *Willow*, and of *Elm*, are all occasionally used for different purposes in medicine.

Of ROOTS not specifically mentioned in our preceding notices, we may here name *Gentian*, a useful stomachic bitter; the root of the *Onion*, the *Leek*, and the *Garlic*; the SQUILL, an active medicine upon many occasions; of *Marshmallows*, as a demulcent; *Horseradish*, as a very useful stimulant; of *Sweet-Flag*, as a fragrant scent; of *Columba*, as a useful tonic bitter; of *Meadow-Saffron*, as a powerful medicine in gout and rheumatism; of the *Garden Carrot*, used as a poultice to cancerous and other ulcers; that of *Liquorice*, used as a demulcent; *Pellitory of Spain*, as a sialagogue; *Sarsaparilla*, which is brought from South America and Virginia, is a demulcent and diuretic; *Sassafras* root is still very commonly used for an infusion, and drunk as tea; *Rattlesnake* root, a stimulating medicine in a variety of complaints; *Virginian Snake-root*, another useful stimulant; the root of *Indian Pink*, together with its leaves, is a useful vermifuge; and *Wild Valerian*, the product of our own heaths and pastures, is advantageously employed in hysterical and other spasmodic complaints.

Of *Herbs* and *Seeds* not specifically alluded to in our preceding sketch, we notice here *Wormwood*, a good stomachic bitter; *Peppermint*, and its *essential oil*, a valuable plant of our own country; *Spearmint* and *Pennyroyal*; *Lavender Flowers*, and their *essential oil*, should also be noticed among our stimulating aromatic cordial medicines; *Origanum*, or *Common Marjoram*, an indigenous plant chiefly useful as producing the powerful essential oil called *oil of origanum*; the chief oil consumed in this country is, however, imported from abroad. The *leaves* of *Savin*, made into an ointment for a perpetual blister, by being boiled with wax and lard; the *Lesser Cardamom* seeds, and *Grains of Paradise*, as useful stimulants, should also be noticed. We may also mention here a seed imported from the East Indies, the pro-

duct of what plant is in this country not known; it is called *Adjowaen;* from which may be drawn an oil similar in properties to oil of origanum; it is sometimes sold for that article, and occasionally under the more specious name of *oil of thyme.*

TOBACCO, *nicotiana tabacum*, is an annual plant, a native of America. It was first discovered by the Spaniards in Yucatan in 1520, and was then called *petun* or *petum.* It was sent to Spain from *Tabaco*, the name of a Mexican province; and hence its name. There are, however, different accounts of the origin of the word *Tobacco.* Sir Walter Raleigh first introduced it into England about 1585, and taught the English how to smoke it. A curious story is often related of Sir Walter and tobacco, when residing at his house at Islington, for many years known as an inn called the *Pied Bull.* This old mansion has at length met the fate of all sublunary things; it ceases to exist. Of tobacco, as a luxury, it is not necessary to speak; as a medicine, it is narcotic, emetic, and errhine; and to some constitutions even poisonous. Tobacco is occasionally cultivated in this country; but revenue regulations amount almost to a prohibition of its culture.

SNUFF is chiefly composed of the powdered stalks and other refuse portions of the tobacco plant, other matters being added to it to give it various scents according to the taste and interest of the snuff makers and takers. The sorts of snuff are almost innumerable; but *Scotch* and *Rappee* are well known. Snuff, as an errhine, may be occasionally useful, but the constant and filthy practice of snuff-taking cannot be commended.

The following vegetables, or preparations from vegetables, are all very powerful in their operation on the human body; some, indeed most of them, are esteemed poisons; but in the hands of the skilful are often rendered useful in several diseases.

Hemlock, used in cancerous complaints; *Foxglove*, used in dropsy; *Henbane*, as a useful narcotic; *Stramonium*, for asthma; *Lettuce*, as a narcotic; *Belladonna*, or *Deadly Nightshade*, as a narcotic, diaphoretic, and diuretic; *Woody Nightshade*, or Bitter-sweet, used in asthma and dropsy. *Black* and *White Hellebore* roots; the first is a cathartic, good in dropsies; the last as an errhine and for many eruptions of the skin. PRUSSIC ACID may also be mentioned as a powerful medicine lately exhibited in consumption. It is obtained by distillation from the kernels of the almond, the peach, and other similar fruits. But it is also a most powerful poison. *Iodine* is also a peculiar substance, of a violet colour, obtained from the ashes of *kelp.* It is extremely volatile, and has been lately given as a powerful stimulant in several complaints. This substance was first discovered at Paris in the year 1812.

MUSTARD has not been mentioned before; but it is a useful stimulant in many complaints, and as a poultice. Its use as a condiment is too well known to be noticed.

We may also mention GALLS, the production of an insect which deposits its eggs on the leaves or the shoots of the *quercus infectoria*, a species of oak growing in Asia Minor. Galls are used extensively in the arts as a dye, for making ink, and also the infusion of galls as a chemical test: as a medicine they are powerful astringents, and contain in abundance an acid called the *Gallic acid.*

QUASSIA is a bitter wood brought from Jamaica; it is tonic, and used in debilities.

COW-ITCH is a fine hairy down growing on the pods of the *Dolichos pruriens*, a plant native of the East and West Indies. Applied to the skin it produces intolerable itching; mixed with treacle it has been found serviceable in destroying worms.

GAMBOGE is a yellow extract or gum well known to painters in water colours. It is brought to this country from the East Indies. As a medicine it is a powerful purgative in many complaints.

TINCTURES are those medicines and other preparations in which some drug is digested in spirits of wine or proof spirit, so as to extract its virtues and at the same time *stain* the liquor; hence the term *tincture*. Tinctures are almost as numerous as the articles of the Materia Medica: thus we have *tincture of senna, tincture of jalap, tincture of myrrh*, &c.

Oils.

OIL is a fat unctuous inflammable and generally liquid matter, obtained from several bodies. Oil is of two kinds, *fixed* and *volatile*. The *fixed* oils are those which are not capable of being raised in vapour under ordinary temperatures. *Olive oil, lintseed oil, cod oil*, &c. belong to this class. *Essential* oils are those which generally contain the essential properties of the substance from which they are obtained; they are usually also the product of distillation, and are readily volatilized by heat; often by the temperature of the atmosphere. Oil of peppermint, cinnamon, &c. belong to this class.

OLIVE OIL is brought into this country of three distinct qualities. The first kind, used chiefly as food, is called *salad. Florence, flask*, or *Lucca oil;* it is of course the finest and the best; the second is called *Genoa*, or *second oil*, much used in medicine; and the inferior kind, having a rank and somewhat offensive smell, is called *Gallipoli oil*. This last is used chiefly in our woollen manufactures.

Olive oil is obtained from the fruit of the *olea Europæa*, or European olive. The ripe fruit is gathered in November, and immediately bruised in a mill, the stones of which are set so wide apart as not to crush the nut. The pulp is then pressed in bags made of rushes, and by gentle pressure the best oil, called virgin oil, flows first. A second sort is obtained by breaking the marc, moistening it with water and pressing it; an inferior kind is obtained by boiling the magma or by other processes, and then submitting to the full force of the press. The oil is cleared from its feculence by standing and then by being poured off. It is said the best oil is made in Provence; but it is brought from numerous places contiguous to the Mediterranean. The consumption of olive oil is almost incredible; it supplies in the south of Europe the place of butter, and indeed is quite a necessary of life in many warm climates.

OIL OF ALMONDS, improperly called oil of *sweet* almonds, is obtained generally from bitter almonds, by simply passing them with their skins, without any preparation, through a mill, and then subjecting them in hair cloths to the press; almonds generally yield one third of their weight of oil; the oil becomes fine by merely remaining still, when it is poured from its feculencies. The same oil can be obtained from sweet almonds, but it is in no respect different from that obtained from the bitter, the taste of the bitter almond not passing out with the oil. As a medicine this oil is demulcent; it never congeals in the temperatures of this country.

CASTOR OIL is obtained from the seeds of the *Ricinus communis*, an annual plant, a native of the East, West Indies, South America, and Africa. It is of very quick growth, and sometimes attains the height of sixteen feet; the leaves are very large; the seeds are contained in a trilocular nut, covered with rough spines; they are of an oblong flat figure, and spotted something like a dwarf kidney-bean. The oil is obtained from the seed both by coction and expression; that obtained without heat is the best. Castor oil has a peculiar smell and taste; in doses of half an ounce it forms one of the best and safest purgatives known.

PALM OIL is brought to this country in casks from the coast of Africa. It is of the consistence of hard butter, of an orange or reddish yellow colour, and when *fresh*, not of an unpleasant taste; but it soon grows rancid and spoils; it is used by the negroes as food. It is said to be the product of the *cocos butyracea*, a species of palm, but this is doubtful. As a medicine it is of no use; it is used in the arts for soap, &c.

LINTSEED OIL is too well known to need description; it is usually obtained by grinding the seeds, then subjecting them to heat in iron pans, and afterwards pressing them by powerful machinery. This oil is used extensively by painters; it is also used occasionally, when cold-drawn, in medicine. The cake left after the oil is expressed is used for fattening cattle. The cake is also powdered and used as *lintseed-meal*, valuable in poultices.

Oil sometimes takes its name from the material with which it is scented or mixed, as *oil of roses*, *oil of jessamine*, &c.

We may here notice CROTON OIL, obtained from the *Croton tiglium*, and lately introduced as a powerful purgative in very small doses; from one drop to two is a full dose.

The *Essential* oils of most value and importance are OIL OF TURPENTINE; OIL OF ORIGANUM; OIL OF PEPPERMINT; OIL OF SAVIN; OIL OF JUNIPER; OIL OF CLOVES; OIL OF NUTMEGS; OIL OF CINNAMON; OIL OF PIMENTA; CAJUPUTI OIL, lately brought into notice as a powerful medicine in dropsy, rheumatism and palsy. It is distilled from the leaves of the *melaleuca leucadendron*, a small tree growing in the East Indies. OIL OF LAVENDER, *Essence of Bergamotte*, and *Essence of Lemons* are pleasing scents; oil of lavender also forms, dissolved in a strong proof spirit, an elegant *lavender water*.

The ACIDS of the vegetable kingdom are numerous; the chief however are the *acetic*, which constitutes vinegar and the pyrolignous acid; the *citric*, found in the *citron;* the *lemon* and *orange;* the *Prussic*, found in the kernels of many fruits and in the leaves of the laurel; the *gallic*, found in *galls;* the *oxalic acid*, found in some fruits, and in considerable quantity in wood sorrel, the *oxalis acetosella*, it is also obtained from sugar, and hence has been termed *acid of sugar;* in large doses it is highly poisonous, and is frequently taken by mistake, being in small needle-like crystals. See POISONS. The *tartaric* acid is abundant in *cream of tartar*, which is a *supertartrate of potash;* see TARTAR, in our commercial section.

ALKALIES.

ALKALIES are saline substances possessing a hot and caustic taste, and readily corrode the flesh of animals; they also convert a

vegetable blue to a green colour, are soluble in water, and combine in various ways with acids, forming a variety of new bodies of very different qualities. With oils they form soaps. They are known under two forms, the *fixed* and the *volatile.* The *fixed* alkalies are *Potash* and *Soda;* the *volatile alkali*, or *Ammonia*, is obtained from animal matter; and latterly, it has also been procured in large quantities from the distillation of coal for gas.

The *fixed* ALKALIES, *Potash* and *Soda*, are products of the vegetable kingdom; and used largely both in medicine and the arts, chiefly in medicine, in combination with acids forming *neutral salts.* Soda, indeed, is also obtained from the salt of the sea and that of mines. We shall consider both as medicines here.

POTASH is obtained from the ashes of almost every species of vegetable, by merely pouring water upon them, which dissolves the salt; the water is then evaporated to dryness, and a white granular mass is left, which is a *carbonate of potash*, and constitutes the pearl ashes of the shops. This article dissolved in water, filtered to render it still purer, and boiled down to dryness, is the *Salt of Tartar* of the shops. It was formerly obtained from tartar, but as obtaining it from that article was troublesome, and the product no way different, the more ready method of obtaining it from potash has been adopted. It is a useful medicine in acidities of the stomach, &c. See *Potash*, under our commercial head. Potash is distinguished by absorbing moisture from the atmosphere. Potash combining with nitric acid forms the *Salt Petre* or *nitre*, *Nitrate of Potash*, of medicine and commerce. Potash is the basis also of many other valuable neutral salts; deprived of its carbonic acid, it is extremely caustic, and quickly decomposes the living animal fibres.

The *basis* of Potash was, in the year 1807, discovered by Sir Humphry Davy by submitting it to the action of Galvanic electricity, to be a *metal*, to which the name of *Potassium* has been given; it is white and of great lustre, of the consistency of soft wax; it is lighter than water; and thrown into that fluid it instantly takes fire. By this discovery *caustic potash* is found to be a compound of potassium and oxygen.

SODA is obtained from the incineration of marine plants, particularly from the ashes of many species of the *salsola;* it is obtained in a similar way to that of obtaining potash. It is brought to this country from Spain in masses called *barilla*, an impure carbonate of soda; it is purified by lixiviation and crystallization. It is a useful medicine in acidities of the stomach. Soda combines with many acids, forming medicines of more or less importance; with the *muriatic acid* it forms the *common salt* of commerce; with the sulphuric acid it forms sulphate of soda, or *Glauber's salts*, so well known as a purgative. The carbonate and other salts of soda are distinguished by efflorescing on exposure to atmospheric air. Soda, deprived of its carbonic acid, is caustic, and quickly corrodes the animal fibre. See SALT, p. 33.

The *basis* of soda (discovered by the same means, and also by Sir H. Davy, as potassium) is also a metal which has been named *sodium;* it is soft, malleable, and lighter than water; in colour it resembles lead; it burns when heated in contact with air; thrown on water it produces violent action, but it does not in general inflame. Both these articles require close vessels to preserve them.

NITRE. *Nitrate of potash*, or *saltpetre*, is an inflammable neutral

salt, consisting of nitric acid and potash. It has a bitterish sharp taste, occasioning a sensation of cold both in the mouth and stomach; it is generally in white pellucid six-sided crystals. Nitre has been long used in medicine and the arts; it is not, however, decided whether our saltpetre be the nitre of the ancients: most authors supposed that their nitre was a native mineral or fossil; whereas our saltpetre is in a great measure artificial. There were nitre pits in Egypt, as there are salt pits among us, but the salt produced from those appears to be an impure subcarbonate of soda. All the saltpetre we now have is drawn either from earths moistened and manured with the excrements of animals; or from old walls, and the plaster of ruined buildings, which have imbibed nitrogen from the air encompassing them.

Artificial saltpetre is procured in several places in the kingdom of Pegu, &c., and in villages anciently populous, but now desert; and about the banks of the Wolga in Russia. It is drawn from clay or earths, black, yellow, and white; the black yields the best, and needs no purifying after it comes to us, to fit it for making gunpowder. The method of working it is this: two flat pits are dug, one of which they fill up with the earths, turning water upon it for some time, and then tread it with their feet to the consistence of pap, letting it stand two days for the water to imbibe all the salt. They then pass the water into another pit, where, standing some time, it shoots and crystallizes into saltpetre. This they boil once or twice, as they would have it more or less pure, scumming it continually, and filling it out into pots of twenty-five or thirty pounds each, and exposing these to the air in clear nights, by which means, if there be any impurity, it sinks to the bottom; they then break the pots, and dry the salt in the sun. Another kind of artificial saltpetre is that prepared from nitrous matters, collected in old buildings, ancient ruins, &c., by means of ley made of wood ashes. Of this great quantities are made in France, particularly in the arsenal of Paris, where there is a corporation of saltpetre-makers. Good common saltpetre should be clean, white, dry, and as free from common salt as possible. The best refined saltpetre is that, the crystals of which are the longest, largest, and finest. The principal part of the saltpetre used in Britain is imported from the East Indies in dirty small crystals; it is *refined*, the state in which it is found in the shops, in this country. Spain also affords considerable quantities; but all dry countries produce it; the earth absorbing nitrogen gas from the atmosphere, and the vegetable alkali in the clay combining with it, nitre is formed in the soil ready to be dissolved and carried off by water. The bases of the gases that form saltpetre have the property of rarifying or expanding to a prodigious degree. It is hence *gun-powder*, of which saltpetre is the principal ingredient, derives its force. It is computed, that when inflamed, it takes up *ten thousand times* the space it possessed before. There are abundance of chemical preparations made with saltpetre, as *spirit of nitre*, or *nitric acid*, *aqua-fortis*, &c.

Medicines obtained from the Animal Kingdom.

AMMONIA, or Volatile Alkali, is said to be a compound of nitrogen and hydrogen. *Ammonia*, in a pure state, is a gaseous body, extremely pungent and acrid, but when diluted with common air

agreeably stimulant. It unites, in almost all proportions, with water, forming the *Spirit of Hartshorn* and *Spirit of Sal Ammoniac*, &c. of the shops. It is obtained by burning bones, or by the distillation of animal matter, as urine, &c. What is called *Sal Ammoniac*, which is a combination of ammonia and muriatic acid, or *muriate of ammonia*, was formerly brought from Egypt, and believed to be procured only from the urine of camels; it is now manufactured in great abundance in this country, by distilling animal matter, chiefly *bones*, in iron pots exposed to a red heat: the caput mortuum of the bones forms the *ivory-black* of the shops. By some such process is also obtained the *carbonate of ammonia*, or the *volatile smelling salts* of the shops, *salts of hartshorn*, &c. Carbonate of ammonia is now obtained in large quantities from the distillation of coal for gas, as stated in a preceding article.

The volatile alkali is a powerful stimulant, whether given in the form of a carbonate or as a liquid. It is also a useful test to detect the presence of copper in many liquids; it turning the liquids in which copper exists, even in very small quantities, of a violet shade more or less intense.

CANTHARIDES, or *Spanish Flies*, are a very valuable medicine; being mixed in powder with yellow resin, wax, Burgundy pitch, and horse turpentine, as a plaster for producing blisters.

The *Spanish Fly*, *cantharis vesicatoria*, is a brilliant insect about three-quarters of an inch long, of a greenish hue; it is found on the privet, ash, elder, and many other trees in Spain, France, Italy, and other places. They are gathered by smoking the trees on which they are found with brimstone, and catching them on a cloth spread underneath. They are imported into this country from Sicily, but chiefly from Astracan.

SPERMACETI (*Cetaceum* PHAR. LOND.) is a whitish, flaky, unctuous substance, chiefly the brain of the *physeter macrocephalus*, or spermaceti whale. It had the name *spermaceti* given to it under the erroneous belief of its being the seed or sperm of the whale. The brain is first grossly freed from the oil by draining and pressing, then melted, and afterward more perfectly purified by boiling in a *ley*, containing caustic potash, which combines with the remains of the oily matter into a saponaceous liquid. The process of boiling is generally repeated two or three times till the spermaceti becomes perfectly colourless and transparent. It is then poured into coolers, where it hardens, and is afterwards cut into pieces; in doing which it falls into the flakes as it is found in the shops. Spermaceti, or *sperm*, as it is called by the dealers in it, is also obtained from spermaceti oil by filtration, &c. Spermaceti should be kept close from the air. It is of some use in medicine. But its greatest property is in softening the skin, whence it is used by the ladies in pastes, washes, &c.

It should be mentioned, that by *long* boiling in *one* ley the spermaceti is converted into a kind of soap, and of course its qualities as spermaceti destoyed.

Spermaceti candles are rather of modern manufacture. They are made smooth, with a fine gloss, superior to the finest wax candles in colour and lustre, and, when genuine, leave no spot or stain on the finest silk, cloth, or linen.

SPONGE is too well known to need description. It is considered by naturalists as belonging to the zoophyte class of animals. The most remarkable is that called the *Patera*, *Goblet-Sponge*, or *Sponge*

plant, found on the shores of Singapore, in the East Indies. In form it resembles a capacious cup or bowl; its texture is non elastic, but is composed of numerous tubes or anastomosing cells; a specimen measured at the brim seventeen inches in diameter; the cavity was capable of holding thirty-six quarts.

Sponge contains a considerable portion of vôlatile alkali; and being burnt, is given in bronchocele or Derbyshire neck. Sponge is occasionally found on the sea-coasts of this country; but the sponge of commerce is generally obtained from the Mediterranean and India.

AMBERGRIS, or gray amber, is a solid, opaque, ash-coloured, fatty, inflammable substance, variegated like marble, remarkably light, rugged and uneven on the surface, and has a fragrant odour when heated. It is found swimming upon the sea, on the sea-coast, or in the sand near the sea-shore; especially in the Atlantic Ocean, on the sea-coast of Brazil and that of Madagascar, on the coast of Africa, the East Indies, China, Japan, and the Molucca islands: but most of the ambergris which is brought to England comes from the Bahama islands, &c. It is also sometimes found in the stomach or intestines of the spermaceti whale by the whale fishermen, always in lumps of various sizes and shapes, weighing from half an ounce to a hundred pounds and more. An American fisherman, some years ago, found a piece of it in a whale which weighed about 130 pounds, and sold it for 500*l*.sterling. There have been many different opinions concerning the origin of this substance. But it having been frequently found in the belly of whales; and always, when in large masses, interspersed more or less with the beaks of the cuttlefish, their common food; it is now considered as an animal production. The use of it is now nearly confined to perfumery, though it has formerly been recommended in medicine. In Asia and Africa considerable use is made of it in cookery, by adding it to several dishes as a spice. Our perfumers add it to scented candles, balls, bottles, gloves, and hair-powder; and its *Essence* is mixed with pomatums for the face and hands.

ISINGLASS is a preparation formerly made only from the *acipenser huso*, or great sturgeon; now obtained from certain parts of the entrails of several fishes: the best, however, is the product of the sturgeon, and is almost exclusively prepared in Russia. Isinglass, when good, consists of almost pure gelatine. It should be free from taste and smell, and entirely soluble in warm water. As isinglass is nothing more than certain membranous parts of fishes, separated from extraneous matter, then twisted and dried into the shapes in which we find it, no doubt our own fisheries, particularly those of North America, would supply us with considerable quantities of this useful substance. The sounds or air-bladders of *fresh water fish* are in general preferred for this purpose, as being the best: these constitute the finest sorts of isinglass. The *book* and ordinary *staple* are made of the intestines of the fish. That called *cake isinglass* is formed of the fragments of the staple sorts. Isinglass is best made in the summer. Prodigious quantities of fish that afford this article are found in the Wolga and Don, in the Caspian Sea, &c. Isinglass is sometimes used as a medicine, and may be useful in a thin acrimonious state of the juices. Boiled in milk, it forms a nutritious jelly; it is the basis of our *blanc manger*. An aqueous solution of it, with a very small quantity of some balsam, being spread on black silk,

forms the *court-plaster* of the shops. But its chief use is in fining beer and other liquors, the impurities of which it carries down by being poured on them in solution.

MUSK, a perfume, of a very strong and durable kind, and only agreeable when moderated by the mixture of some other perfume. It is found in a bag, or tumour, about the size of a hen's egg, growing under the belly, near the genital parts, of the *moschus moschiferus*, or Musk Deer, and appears to be a peculiar secretion. The animal is pretty common in Tonquin, Cochin China, &c., but the most esteemed is found in Thibet. It inhabits woods and forests, where the natives hunt it down. Musk is much used by the perfumers. As a medicine it is antispasmodic, it is also useful in typhous fever. It has the strongest of all known odours. Tavernier brought one of the animals with him to Paris, the odour of which was so strong, that it made every head in the house giddy. Musk is adulterated in various ways.

ANIMAL OILS, under the name of *oil*, are not much used in medicine. *Cod oil* has, however, been occasionally taken as a medicine in rheumatic and paralytic complaints; *hog's lard*, *mutton suet*, and *butter*, occasionally contribute to the healing art. WHITE and YELLOW WAX should also be mentioned as useful ingredients in plasters, &c.

CASTOR is obtained from the *Beaver*, the *Castor fiber*, an amphibious quadruped, inhabiting the northern parts of Europe, Asia, and America; it is one of the most intelligent of animals, building its residence with much skill, and living in communities, from which the idle are banished. It is about the bigness of a middle-sized dog; it is occasionally brought to this country and domesticated; its fur is used for hats. It has in each groin a *gland* which contains the matter when dried called *castor*. It is in pods containing about an ounce; castor is of a reddish or liver colour when broken; its smell is strong and peculiar; the best comes from Russia; the more common from Canada and New-England. It is a useful medicine in spasmodic and uterine complaints.

[The vignette on the next page represents the Beaver, with several huts of three stories high, built on the edge of a clear stream, supported and shaded by tall trees and brambles. The huts usually have two doors, one to the water, and one to the land.]

In the *Gardens* of the *Zoological Society* in the Regent's Park are to be seen some beavers sporting occasionally in a pond. (Nov. 1828.)

PHOSPHORUS is a very peculiar substance, obtained chiefly from animal bones. In consistence it resembles wax; when pure it is nearly colourless, semi-transparent, and flexible. Its specific gravity is 1.77; when exposed to air, it exhales luminous fumes, having a peculiar smell similar to garlic. At a temperature of about 100°, it takes fire and burns with intense brilliancy, throwing off copious fumes. Phosphorus has been occasionally given medicinally on the continent, but it is not used as a medicine in this country. *Phosphoric acid* is composed of phosphorus and oxygen; it exists in bones in large quantities in the state of phosphate of lime. *Phosphate of Soda* is a mild cathartic, and excellently adapted for children and others having a fastidious taste.

We cannot close our account of medicines belonging to the animal kingdom, without a glance at that useful little animal, the

LEECH, which consists of several species; but that used in the art of healing, is the *hirudo medicinalis*, or medicinal leech, of an olive-black colour, with four ferruginous lines, and spotted with yellow beneath. It is found in stagnant ponds; it is an oviparous animal, its eggs being hatched by the heat of the sun. Such is the demand for leeches in this country, that a great number of them are annually brought from the continent. They are best preserved in vessels half-filled with soft water in an equal temperature (50°), and covered with

a coarse cloth; the water should be changed once a week. As their natural food is unknown, it is useless to attempt to feed them; in winter it may perhaps be advantageous to put some moss into the vessel. It is scarcely necessary to add, that leeches are very conveniently and usefully applied to various parts of the body, for the abstraction, of blood where it is either inconvenient or improper to employ the lancet. In regard to the *preservation of leeches* it should be mentioned, that some of the mud of the pond whence they have been taken has been lately recommended to be put into the vessel in which they are kept.

Medicines obtained from Earths and the Mineral Kingdom.

EARTHS in modern philosophy, are tasteless, inodorous, powdery, simple substances, insoluble in water, and insipid. Modern chemists distinguish ten earths, namely, *baryta, strontia, lime, magnesia, alumina* or *clay, silica* or *flint, glucina, zirconia, yttria,* and *thorina.* Of these, only four have been used in medicine. *Baryta, barytes, ponderous spar,* or *sulphate* of *barytes,* is found in various parts of England, and on the continent; it is in a crystalline form, varying in colour, with shades of white, red, &c.; its specific gravity is 4.7. A *solution of muriate of barytes* has been long in use as a stimulant and deobstruent in very small doses, chiefly for cancerous and scrofulous affections. In large doses, the *muriate of barytes,* as well as its *carbonate,* is extremely *poisonous.*

MAGNESIA, before the middle of the last century, was frequently confounded with lime, but Dr. Black showed that it possessed properties different from all the other earths. *Native magnesia* is a very rare mineral; it has hitherto been found only at Hoboken, in New Jersey; it is greenish white, and of a lamellar soft texture. It is an ingredient in many fossils; and several of the salts, which it forms by combination with the acids, are found in mineral springs, and in the water of the ocean. From these combinations magnesia is obtained by different artificial processes. The sulphate of magnesia, or *Epsom salt,* is well known as a useful purgative:—see SALT. The *carbonate of magnesia,* which is the common magnesia of the shops, is a useful laxative; *burnt magnesia,* which is magnesia deprived of its carbonic acid, is a powerful absorbent of acidity in the stomach. The earth exists in the state of a white spongy powder, soft to the touch, without smell, and nearly insipid. Magnesia, when quite pure, is infusible.

ALUMINA constitutes some of the hardest stones, such as the sapphire and the ruby and exists in large quantity in many other gems; in *corundum,* the *topaz,* the *garnet,* &c. Native *alumina* is found upon the Sussex coast, near Newhaven. It is white and friable; it contains alumina and sulphate of lime. It exists in abundance in all clay.

From alumina is prepared ALUM, or the sulphate of alumina and potash of the chemists; a crystallized, clear, and transparent salt, consisting of this primitive earth, sulphuric acid, and potash: it is usually sold in large masses; it is of a subacid and astringent taste. Most of the alum to be met with is artificially prepared. It is extremely useful in the art of dyeing; as by means of it a great number

of colours are fixed, and rendered permanent upon cloth. It is also of use in the making of candles, for being mixed with tallow it gives it a hardness and consistence, which it has not naturally. Wood, sufficiently soaked in a solution of alum, does not easily take fire; and the same is true of paper impregnated with it; for this reason it is very properly employed in preserving gunpowder, as it also excludes the air. It is likewise of use in tanning, where it assists in restoring the cohesion of the skin almost entirely destroyed by time. Alum is used on various occasions for fining wines and other spirituous liquors. In medicine it is of use as an astringent, both internally and externally. *Burnt alum* is common alum deprived of its water of crystallization. *Roche* alum is in smaller lumps, and of a reddish hue; it does not appear to be essentially different from common alum. *Alum mines* are said to have been found in Italy in 1460. In 1608, the manufacture of alum was first invented and successfully practised in England; at the present time, the largest manufactures of alum are at Whitby, in Yorkshire.

LIME, when perfectly pure, is highly caustic, and in this state is called *quick-lime*. When lime is electrized negatively in contact with mercury an amalgam is obtained, which, by distillation, affords a white metal, called *calcium;* this metal, exposed to air and gently heated, burns, and produces the *oxide of calcium*, or lime.

Lime is obtained from innumerable substances; from stones, called lime-stones, from marble, from the shells of fish, &c. It exists in various mineral and in most spring waters in the shape of a carbonate, forming in teakettles the well-known *rock*.

Lime-stone, *chalk*, and *marble*, are carbonates of lime; by burning either of these substances with coal, &c. the carbonic acid is driven off, and quick-lime remains. Boiling water poured on quick-lime makes lime-water, which is drunk as a medicine in dyspepsia and many other complaints. *Muriate of lime* has lately been given in scrofula. It is also used in some other preparations.

Lime, as an ingredient in *mortar*, being mixed with sand and water, coal ashes, &c., is of the greatest importance.

CHALK is used on many occasions as a medicine, chiefly in complaints where acidity in the stomach and bowels is prevalent.

SULPHUR, or *Brimstone*, is a simple, inflammable, brittle substance, of a pale yellow colour; it is one of the most universal and important bodies in nature; it produces, when combined with other bodies, some of the most useful and active medicines, as well as combinations of the utmost value in arts and manufactures. Massive sulphur is chiefly brought to this country from Sicily; it occurs native, and is found associated with sulphate of lime and other matters. Its colour is various shades of yellow; it is occasionally in crystals; it is also a volcanic product. *Flowers of sulphur* are obtained from the crude sulphur by simple sublimation, in iron vessels of a large size, in this country.

Roll sulphur is the crude sulphur melted and cast into wooden moulds. Most of the roll sulphur now obtained in this country is the produce of the sulphuret of copper, from the *Parys* copper mine in the Isle of Anglesey.

When sulphur is burnt in atmospheric air, a suffocating acid gas is produced, called *sulphurous acid*. Sulphur burnt with nitre produces a still stronger acid, called the *sulphuric acid;* in common language *oil*

of vitriol. It is prepared in large quantities by burning a mixture of sulphur and nitre in large leaden cisterns, having a few inches of water at bottom; the acid fumes are absorbed by the water, and the water is separated by boiling and distillation; the sulphuric acid remains in the retorts, which are either of glass or platinum. Sulphuric acid is a compound of sulphur and oxygen; its specific gravity should be 1.85. It is devoid of smell and colour; its taste is of course intensely acrid and acid. Sulphuric acid is a useful medicine on a variety of occasions when properly diluted; it forms also numerous compounds: with *iron*, it is *green copperas* or *sulphate of iron;* with *copper*, *blue vitriol* or *sulphate of copper;* with *zinc*, *white vitriol* or *sulphate of zinc.* The uses of these as medicines, and in the arts, as well as indeed numerous other combinations of the sulphuric acid, are innumerable. *Ether*, the lightest of known liquids, is a compound of this acid and alcohol.

VITRIOL and COPPERAS are vague terms applied formerly to several metallic salts, but now only used by the illiterate. *Green vitriol*, or *green copperas*, being *sulphate of iron; blue vitriol*, or *blue copperas*, being *sulphate of copper;* and *white vitriol*, or *white copperas*, being sulphate of zinc.

The term *vitriol* is sometimes also applied, but very improperly, to the sulphuric acid, which, by the vulgar, is also still often called *oil of vitriol.*

The *Nitric acid* has been mentioned under nitre; as a medicine, we may mention here, that it is composed of nitrogen and oxygen, and that it is a very powerful solvent of both animal and vegetable bodies; and combines with numerous bases, forming salts of more or less value and importance, not the least of which is the nitrate of potash or saltpetre before mentioned. Diluted, it is a valuable medicine in a variety of complaints; it is a powerful antiseptic. Distilled with alcohol, it is the *sweet spirits of nitre* of the shops. One of the combinations of nitrogen with oxygen is the *nitrous oxide* or gas, which, being inhaled, produces intoxicating effects, hence commonly called the *laughing gas.*

Aqua fortis is merely a diluted nitric acid.

MURIATIC ACID, or rather *muriatic acid gas*, is obtained from common salt by distilling it in retorts, with a certain portion of sulphuric acid, which, combining with the soda of the salt, forms sulphate of soda, or Glauber's salt; and thus the muriatic acid gas is set free, which being absorbed in large quantities by water, is the muriatic acid or *spirit of salts* of the shops. It gives out a considerable quantity of a suffocating gas; when pure it is colourless, but it is generally tinged of a slight yellow. As a medicine it is tonic and antiseptic. It forms important compounds with metals. With quicksilver it forms *calomel* and *corrosive sublimate;* with *ammonia*, *sal ammoniac;* with *tin*, a useful article in dyeing; with *antimony*, *butter of antimony*, &c. It is also used in bleaching, and other purposes in the arts.

It is now ascertained, that the basis of this acid gas is a gaseous substance, of a yellowish green colour, to which the name of *chlorine* is given; that equal volumes of chlorine and hydrogen, mixed and exposed to light, combine and produce muriatic acid gas, of which water greedily absorbs 480 times its own bulk.

Nitro-muriatic acid, the *aqua regia* of the alchemists, is a mixture of

the nitric and muriatic acids, and in this state dissolves gold, which neither of the acids separately will do.

Chlorine was, on its first discovery, and is yet, sometimes, called *oxymuriatic acid.*

The METALS will be mentioned generally under our commercial head, but a few of them, as medicines, when combined with acids, are too important to be wholly omitted here.

From ANTIMONY are obtained several preparations of great value as medicines; namely, the *precipitated sulphur of antimony;* the *tartarized antimony*, or *emetic tartar;* the *antimonial powder*, or *James's powder*, &c.

From IRON we obtain the *subcarbonate* and the *sulphate of iron*, both valuable medicines; even the *filings* of this metal have been found beneficial in hysterical and dyspeptic complaints. Almost all the preparations of iron appear powerfully tonic; iron is, beyond question, one of the most useful, and at the same time generally innoxious of metals.

Even SILVER dissolved in the nitric acid furnishes us with a very valuable caustic application, *nitrate of silver*, called formerly *lunar caustic.*

ARSENIC has also been enlisted into the service of medicine, and under the name of *arsenical liquor*, or *ague drops*, is given in small doses with success.

COPPER is rarely if ever used internally in modern medicine, although some bold practitioners give sometimes sulphate of copper as an emetic. But the acetate of copper, *verdigris*, is often used as a detergent in ointments, &c.

LEAD has also been occasionally used internally. The *sugar of lead*, properly the *acetate of lead*, has been given as a sedative; it is however a dangerous medicine; indeed all the preparations of lead taken internally are *poisonous.* Externally, lead is often applied in ointments; the well-known *Goulard* is a liquid acetate of lead.

ZINC furnishes us with a powerful emetic in its sulphate or white vitriol: which is also tonic and astringent—a useful medicine in skilful hands. A solution of sulphate of zinc in rose water is an excellent application to chronic inflammation of the eyes.

Calamine is an oxide of zinc useful in ointments.

BISMUTH has also been lately employed medicinally. See part II.

TIN, as a medicine, is only known in powder as a remedy for the tape-worm; but since the discovery that oil of turpentine is more effectual, tin will most probably be laid aside.

QUICKSILVER, or MERCURY, supplies the art of healing with some of the most efficient materials. Among these we may reckon

CALOMEL, *submuriate of mercury*, or *chloride of mercury*, a combination of quicksilver with the muriatic acid. It is given in innumerable complaints, as an antisiphylitic, purgative, &c.

CORROSIVE SUBLIMATE, *oxymuriate of mercury*, or *bychloride of mercury*, is a powerful and highly *poisonous* compound. It is nevertheless, in the hands of the skilful, a valuable medicine. It is composed of quicksilver and muriatic acid; but the acid is in a much larger proportion than in calomel.

Red precipitate, or *nitric oxide of mercury*, is well known as a stimu-

lating application to old ulcers, &c. *Ethiop's mineral* and *cinnabar*, both combinations of quicksilver, with sulphur, are also well known. *Mercurial ointments* need only be named.

Of Bathing

As medicinal means for the recovery or preservation of health, a few words may be here interposed. Of all the simple and easy methods of bathing, we believe that of the sea, in the summer season, and when the water is at its warmest temperature, is by far the best. For bathing in *cold* fresh water we are not great advocates. *Lukewarm* baths are greatly to be preferred; and *hot* and *vapour-baths*, for many rheumatic and other spasmodic affections, are undoubtedly very efficacious.

Of all the waters used as baths in this country,

The BATH WATERS are decidedly the most eminent. They arise in the centre of the city of Bath, in Somersetshire, and have been long used both internally and externally in a great variety of disorders. Their temperature is from 112° to 116° of *F. Ther.* A *wine pint* of Bath water contains 1.2 cubic inch of carbonic acid; 0.8 of carbonate of lime; 1.5 of sulphate of soda; 9, of sulphate of lime; 3.3 of muriate of soda; a trace, only, of oxide of iron; and 0.2 of silica. Hence it has been concluded, that the real cause of the efficacy of the Bath waters, besides their *heat*, is not even now accurately known, the trivial powers of their saline contents not warranting the effects which they are known to produce. As stimulants, these waters are good in cachectic disorders, obstructions of the viscera, swellings succeeding fevers, fits of the gout, and in paralytic disorders; in apoplexy, lethargy, and other similar diseases; and also in dyspepsia. The diuretic power of these waters renders them peculiarly serviceable in dropsy; in leprous, scrofulous, and scorbutic complaints; and in discharging gravelly concretions from the kidneys and bladder. By their diaphoretic quality they stop or moderate habitual laxatives of the bowels, and relieve violent retchings: are good in cutaneous eruptions, occasioned by obstructed perspiration, and generally affecting the face; in rheumatism, not attended with fever or inflammation; and in allaying the pain, and carrying off the paroxysms of the gout. These waters are, however, hurtful in hectic fevers; in suppurations of the lungs; in all cases of inflammation; in hæmorrhages; in plethoric habits; and in scurvy. They are used externally in a variety of disorders with good effect, either by bathing or pumping, as occasion may require, especially if used inwardly at the same time. They have also been of great service in the jaundice, asthma, epilepsy, St. Vitus's dance, hysterical and hypochondriacal complaints, nervous headache, spasmodic vomiting, atrophy, muscular and paralytic contractions. When the complaint is local, pumping is generally preferred to bathing; in this case, the water is hotter than that of the bath; the stream of water is generally directed to the limb or part affected, and sometimes to that part of the spine whence the nerves which supply the place affected issue. Pumping and bathing are often used at the same time: the mud and scum of the waters have been also applied, with good effect, by way of poultice in weak joints, scald heads, running ulcers, &c.: and herbs are sometimes boiled with them in the Bath waters to a proper consistence for such purpose.

BRISTOL WATERS are obtained from springs, known by the name of the Hot Wells, near Bristol. These waters are warm, pellucid, and sparkling; and, if left to stand in a glass, cover its inside with small air-bubbles. They have no smell, and are soft and agreeable to the taste; their heat varies from 72° to 76°; their trivial saline contents consist of neutral salts, of which soda and lime are the chief bases. The Bristol waters are supposed by many to be a modern discovery, and their use only of late date. Dr. Venner, however, nearly two centuries ago, wrote professedly of them, and gave them their true character, except only in regard to diabetes, for the cure of which their use has not been so long known. Dr. Maplet, also, in 1639, wrote largely of their virtues; but, with all his praise, they never came into fashion till their character was established by Drs. Mead and Lane. They are recommended in the dyspeptic complaints produced by a long residence in hot climates; in bilious diarrhœa, and slight dysentery; in the cure, or at least in affording considerable relief in diabetes. But the high reputation which the Hot Wells have acquired, is above all in alleviating some of the most harassing symptoms of pulmonary consumption. That, however, the salubrity of the air, the immediate neighbourhood, and the beautiful scenery, have had their share in the alleviation of disease, we scarcely doubt. The Bristol waters are only drunk; they are rarely if ever used as a bath.

BUXTON WATERS. The waters of the medicinal springs near Buxton in the Peak of Derbyshire resemble those of Bristol. These waters are the hottest in England, except those of Bath, and raise the thermometer to 82°. Taken inwardly they are esteemed good in the bilious colic and loss of appetite; in spasmodic affections, and in the dry asthma without fever. Inwardly and outwardly they are said to be good in rheumatic and scorbutic complaints; in the gout; in inflammation of the liver and kidneys, and in consumptions of the lungs; also in old sprains.

The most celebrated *saline mineral waters* are at CHELTENHAM and LEAMINGTON, in England; *Pitcaithly* in Scotland; and *Seidlitz* on the continent. They are employed in diseases which require constant and moderate intestinal evacuations, such as dyspepsia, hypochondriasis, chronic affections of the liver, jaundice, and scrofulous swellings.

CHELTENHAM WATERS have obtained great celebrity; the town, in Gloucestershire, has risen into a small city in the course of the last fifty years. The waters are the most powerful purging chalybeates in this country; one gallon of which is said to contain an ounce of purging salt. These waters are, beyond question, most effectual when drunk at the springs; which vary somewhat in their saline contents. They operate with ease; the dose varies from half a pint to two pints, or more. In liver affections, dyspeptic complaints, scorbutic eruptions, &c. they are unequalled.

TUNBRIDGE WATERS are also famous as a chalybeate. The wells are situated about six miles from the town of Tunbridge in Kent. This is a brisk light water, has a ferruginous taste: exposed to the air, it soon loses its virtues; as it does also in a few days in bottles. It is sometimes usual to mix with the first glass of the water, taken in the morning, either a little common salt, or some other purging salt, in order to make it operate: with a foul stomach it is

apt to cause nausea or vomiting. The Tunbridge water is chiefly resorted to in June, July, and August; and is recommended in dyspepsia; various debilities; chlorosis, and other female complaints.

MATLOCK WATERS are warm waters (usually at 66°) supplied by several spings at Matlock, in Derbyshire: in their nature and virtues they are similar to those of Bristol and Buxton. The baths are recommended in rheumatic complaints, cutaneous disorders, and in other cases where warm bathing is serviceable. The country is highly romantic and picturesque, and cannot fail to make a favourable impression on the imagination of invalids.

MALVERN WATERS issue from two noted springs, one of which is called Holy Well, the other St. Ann's Well, between Great and Little Malvern, in Worcestershire. They are almost entirely free from earthy matter: three quarts of the Holy Well water being evaporated left behind scarce the fourth part of a grain of sediment. These waters are recommended in diseases of the skin; in leprosies, scorbutic complaints, glandular obstructions; in inflammations and other disorders of the eyes; in the gout and stone; in bilious and paralytic cases. They are likewise used externally by washing the part several times a-day, and afterward covering it with cloths dipped in water, and kept constantly moist. Independently of the water, Malvern, from the elevation of its situation, the purity of its air, the rich, varied, and extensive rural scenery and fine rides around it, is peculiarly delightful as a summer residence.

LEAMINGTON, in Warwickshire, has perhaps more suddenly obtained eminence in consequence of its waters, than any other town in the united kingdom. Their saline contents are more in quantity than even Cheltenham waters; but these last contain somewhat more sulphate of soda, on which both their purgative qualities doubtless chiefly depend. These waters are used for the same complaints as those for which the Cheltenham waters are recommended.

EPSOM WATER contains a large quantity of *sulphate of magnesia*, and hence noted as a purging mineral water; but as this salt can now be obtained more easily and cheaply from the mother water, as mentioned under SALT; these saline waters have long ceased to be the source whence *Epsom Salts* are obtained.

ISLINGTON WATER is a slight chalybeate, and reckoned one of the best about London. The iron is held in solution by carbonic acid. When the acid escapes, the iron is precipitated like rust. It is recommended in indigestion, lowness of spirits, hysteric and nervous complaints, in obstructions of the liver, &c. &c.

The neighbourhood of London abounds with many very similar springs; a good one, now almost neglected, but formerly in repute, is at *Ladywell*, near *Lewisham*; another at Hampstead.

At *Stow*, in Gloucestershire, a very strong carbonated chalybeate has been discovered, which is said to promise much advantage as a tonic.

A spring at *Wick*, near Brighton, has also been analysed; but the chalybeate springs in the united kingdom are innumerable.

HARROWGATE WATERS, near Knaresborough, Yorkshire, have been long noted for being the strongest impregnation of sulphur in England. The springs are four in number, of the same quality, but differing in their powers. They have a sulphurous fetid smell, a bitter, nauseous and saline taste. They operate as a purgative, con-

taining an abundance of common salt, muriate of magnesia, sulphuretted hydrogen, &c. Their dose as a purgative must be large—two pints or more; in smaller doses they are beneficial for many complaints. The rides towards Harewood, Knaresborough, and Studley Park are highly picturesque, and eminently beautiful; and will ever rank this place as one of the most favourite resorts in England.

THE GASES.

In a work of this nature, we ought not to omit the mention of one gaseous body at least, as a useful medicine. Attempts, indeed, were made by the celebrated Dr. BEDDOES, about thirty years ago, to introduce some of the gases as remedies for *pulmonary consumption*, but he was unsuccessful; yet the Doctor's efforts were valuable in another respect; he engaged an ingenious young man of the name of DAVY as his assistant in these attempts. Mr. DAVY, after leaving Bristol, came to London, and is now the eminent person at the head of chemical science, Sir HUMPHRY DAVY.

We have mentioned the composition of the atmosphere under our anatomical description of the human body, and have there shown the ultility, nay necessity, of *oxygen*, to the support of human life and combustion; we also alluded to

CARBONIC ACID Gas as a small ingredient in the atmosphere. This gas in a fixed state is found in abundance, more or less, in almost all natural bodies. It is absorbed in large quantities by water, and contributes generally to that lively sparkling appearance which most spring waters possess. It is also abundantly evolved in the fermentation of all vinous liquors, and gives them their sparkling vivacity, seen in champagne, cider, and malt liquors, very conspicuously. Carbonic acid is also a component part of many minerals; it, in combination with lime, forms marble, chalk, lime-stone, &c. This gas is heavier than common air, and is therefore frequently found in mines; and as no human being can live in it, many persons are often destroyed by descending into caverns, mines, and wells where this gas abounds. It is called choke-damp in the mining districts. In a grotto near Naples, called the *Grotto del Cane*, it runs out at the opening like a stream of water, and if a dog or other animal thrusts his nose into it he is immediately killed.

Notwithstanding the deleterious effects of this gas when inhaled, it may be taken into the stomach not only with impunity, but with advantage, as is well known. It is this gas that gives the pleasantness to soda water, to ginger beer, &c.; it has also been latterly given in typhus, and in irritability of the stomach produced by vomiting; in the former it is given by administering yeast, bottled porter, &c.; in the latter by disengaging it from salt of tartar by lemon juice, and drunk while effervescing.

SODA WATER is chiefly water strongly impregnated with carbonic acid, and having also a slight dose of carbonate of soda in solution. It is used very generally as a medicated beverage, and is considered antacid and lithontriptic. It is made in different ways; in London in the large way, by processes not generally known; but the article thus made is much better than can be prepared by private individuals.

We may just mention, that an apparatus called a *pneumatic appara-*

tus has been invented for the more readily receiving gas, and of transferring it from one vessel to another.

ELECTRICITY, as a powerful remedy in cases of paralysis and other loss of action, ought also to be mentioned. It is not consistent with our plan to detail this subject at large, but we may just observe, that electricity in its powerful and appalling effects is seen and heard in lightning and thunder. The *electric fluid*, or whatever it be that produces the phenomena, is found pervading all natural bodies. In passing into *animal* bodies it produces *shocks*, sometimes instant *death*. To collect this fluid so as to observe its effects in a visible manner, *electrical machines* have been invented; the origin of the term *electric* we mentioned under *Amber*. When this fluid has been collected in unusual quantity, from whatever cause, the moment it comes in contact with a body not possessing it equally with the body containing it, it passes rapidly, and with a flash of light, *into* the body containing the lesser quantity. A body containing the electric fluid in excess is said to be *positively* electrified, the fluid passing *from* that body to some other body; when a body contains the electric fluid in a less quantity than the surrounding bodies, it is said to be *negatively* electrified, and the fluid passes from the surrounding bodies *to* the body negatively electrified. A mixture of hydrogen and oxygen gases, having the electric fluid passed through them, combine with explosion, and form water; hence, probably, much of the rain in thunder-storms. Another kind of electricity has also been exemplified in

GALVANISM, which, by means of the large galvanic apparatus at the Royal Institution, has been exhibited in its effects in a brilliant and surprising manner. This apparatus consists of plates of copper and zinc united together, to the number of several thousand, and immersed in troughs filled with a weak solution of nitric and sulphuric acids in water. If wires be brought from the two extremities of the apparatus, the moment the wires approach each other an arc of fire is produced, in which bodies most difficult of fusion melt. It was by this apparatus that Sir HUMPHRY DAVY discovered the metals sodium and potassium. By this apparatus is water decomposed into its original elements, oxygen and hydrogen. By a similar apparatus also did Dr. URE, on the dead body of a criminal, in 1818, display at Glasgow, the powerful effects of galvanism, in exciting the muscles of the human body; so much so, indeed, as to lead to the belief that, sometimes by it, persons apparently dead, may be restored to life.

POISONS may be defined substances which prove fatal to the life of animals, whether taken by the mouth, mixed with the blood, or applied to the nerves by friction of the skin, or other means. Most of the substances called poisonous are only so in certain doses: when given in smaller quantities they are, many of them, active medicines. Others are fatal in the smallest quantities; such are those of *hydrophobia* and the *plague*.

All the known poisons may be arranged under five sections.

First. *Irritating Poisons*, or those which produce inflammation of the parts to which they are applied; such are the concentrated acids, alkalies, most of the preparations of mercury, arsenic, verdigris, and other salts of copper; antimony, in all its preparations; the salts of tin, gold, bismuth, nitrate of silver, sal ammoniac, the salts of lead, liver of sulphur, salts of barytes, glass in fragments, cantharides, acrid plants, or their concrete juices, as colocynth, mezereon, wolf's bane, &c.

The second are *Narcotic* or *stupefactive poisons.* This class comprehends opium, poppies, henbane, prussic acid, the oil, extract, and distilled water of cherry laurel; oils and waters distilled from most bitter kernels; the bitter almonds, the strong-scented lettuce, the nightshade, the yew, the lentil.

The third, *Acrid narcotic poisons*, comprehending mushrooms, nux vomica, the upas, cocculus indicus, tobacco, hemlock, deadly nightshade, stramonium, fox-glove, spirituous liquors, &c.

The fourth, *Septic* or *putrefactive poisons:* this class comprehends the poison of the *viper*, and all other animals, the bite or sting of which gives rise to accidents more or less serious; animals that become baneful by being taken into the stomach; malignant pustules, and hydrophobia.

The fifth, the *Poisons* of *certain gases* when inhaled, usually producing death.

As we cannot treat of these at large, we think our object will be best accomplished by the following tabular statements; the first column containing the *names* of the poisons; the second the *symptoms*, and the last the *remedies.* But we nevertheless advise, in every case where poisons have been taken, recourse to the best medical assistance at once. We pretend to no originality in these tables; similar ones have been published by Dr. Uwins, Mr. Stow, and Mr. Jennings; they are extremely useful.

But although we advise, if possible, when poisons have been taken, instant medical advice, it often happens that none is at hand, and if we wait till the arrival of a medical man, the patient may be irrecoverably lost; the judgment, therefore, must, in such cases, be exercised at once. No one ought, therefore, to be unacquainted with the following tables.

Substances.	*Symptoms.*	*Remedies.*
CONCENTRATED ACIDS. The vitriolic or sulphuric, nitric, muriatic, oxalic, &c.	Burning pain, vomiting; matter thrown up effervescing, with chalk, salt of tartar, lime, or magnesia.	Calcined magnesia; 1 oz. to a pint of warm or cold water. A glass full to be taken every two minutes, so as to excite vomiting. Soap, or chalk and water; mucilaginous drinks afterwards, such as lintseed-tea or gum-arabic and water.
ALKALIES: Potash, soda, ammonia, lime, &c.	Nearly the same: the ejected matter does not effervesce with alkalies, but acids.	Vinegar or lemon-juice; a spoonful or two in a glass of water very frequently; simply warm water.
MERCURIAL PREPARATIONS: Corrosive sublimate, &c.	Sense of constriction in the throat; matter vomited sometimes mixed with blood.	White of eggs; twelve or fifteen eggs beaten up, and mixed with a quart of cold water. A glassful every three minutes; milk, gum water, lintseed tea.

Substances.	*Symptoms.*	*Remedies.*
ARSENICAL PREPARATIONS: White arsenic, &c.	Extreme irritation; pain, sickness, and speedy death, if the poison be not soon counteracted.	Warm water with sugar, in large quantities, to excite vomiting. Lime-water, soap and water, pearlash and water, mucilaginous drinks.
PREPARATIONS of COPPER: Brass, verdigris, halfpence, &c.	Symptoms nearly the same as from mercury.	White of eggs; mucilaginous drinks. See MERCURIAL PREPARATIONS, above.
PREPARATIONS of ANTIMONY: Emetic tartar, &c.	Extreme sickness, with other symptoms of poison, as above stated.	Warm water or sugar and water; afterwards a grain of opium, or fifteen drops of laudanum, every quarter of an hour, for two or three times.
NITRE, or SALT-PETRE.	Obstinate vomiting; sometimes of blood, &c.	The same as for arsenic, with the exception of lime-water and alkalies.
PHOSPHORUS.	Like mineral acids.	Like mineral acids.
LEAD: Sugar of lead, Goulard's extract, &c.	Great pain in the stomach, with constriction of the throat, &c.	Large doses of Glauber's or Epsom salts in warm water.
BARYTES: The carbonate, muriate, &c.	Vomiting, convulsions, palsy, pain in the stomach, &c.	Half an ounce of Epsom or Glauber's salts dissolved in a quart of water. Several glasses to be taken. In place of these salts, large draughts of hard well-water.
PRUSSIC ACID.	The most virulent poison, producing almost instant death, when applied even in small quantities to the surface of the body.	Emetics; afterwards oil of turpentine, ammonia, brandy, with warmth, friction, and blisters.
SAL AMMONIAC.	Excessive vomitings, convulsions, pain in the bowels, alteration in the features; death.	Vomiting to be rendered easy by large draughts of warm sugar and water. If vomiting be not produced by the poison, it must be excited by the finger. Afterwards opiates.
GLASS, or ENAMEL.	If taken in coarse powder, produces irritation and inflammation of the bowels.	Large quantities of crumb of bread should be eaten; afterwards an emetic of white vitriol, and demulcent drinks.

Substances.	*Symptoms.*	*Remedies.*
ALCOHOL: Brandy, rum, gin, wine, &c.	Intoxication: when taken in large quantities, insensibility, apoplexy, or paralysis; countenance swoln, and of a dark red colour; breathing difficult, often death.	A powerful emetic of white vitriol, or emetic tartar; vomiting to be encouraged by warm water, and large clysters of salt water; bleeding; if the head be very hot, cold wet cloths may be applied: if the extremities be cold, friction.
IRRITATING VEGETABLE POISONS: Monk's hood, meadow-saffron, ipecacuanha, hellebore, bear's foot, savine, &c.	Acrid taste; excessive heat; violent vomiting; purging; great pain in the stomach and bowels. Externally applied, many of them produce inflammation, blisters, pustules.	If vomiting be produced by the poison, large draughts of warm water or thin gruel, to render it easier. If insensibility be present, white vitriol or other active emetic: after the operation of which, a brisk purgative; then a strong infusion of coffee or vinegar diluted with water.
NARCOTICS: Opium, henbane, hemlock, nightshade, &c.	Stupor; desire to vomit; heaviness in the head; dilated pupil of the eye; delirium; speedy death.	Four or five grains of emetic tartar in a glass of water. If this dose does not succeed, four grains of blue vitriol, as an emetic. Do not give large quantities of water. *After* the poison has been ejected, give vinegar, lemon juice, or cream of tartar and strong coffee.
ACRID NARCOTICS: Mushrooms.	Nausea; heat; pain in the stomach and bowels; vomiting; purging; thirst; convulsions; cold sweats; death.	Three grains of emetic tartar in a glass of water: in fifteen minutes the dose to be repeated. After vomiting, frequent doses of Glauber's or Epsom salts, and stimulating clysters.
Nux vomica, St. Ignatius's bean, the upas, cocculus indicus, &c.	None of these inflame the parts they touch. Introduced into the stomach, or applied to wounds, they are rapidly absorbed, producing generally rigidity, convulsions, and death.	The emetic as under MUSHROOMS; lungs to be inflated. Two ounces of water, one drachm of ether, two drachms of oil of turpentine, and half an ounce of sugar, mixed together; two spoonfuls of which to be taken every ten minutes.

Substances.	*Symptoms.*	*Remedies.*
POISONOUS FISH: Oldwife, lobster, crab, dolphin, conger eel, muscle, &c.	In an hour or two, or sooner, after some fish have been eaten, more especially if stale, weight at the stomach, sickness, giddiness, thirst, &c. come on; in some cases, death.	An emetic; vomiting to be excited by tickling the throat with the finger, and by draughts of warm water. After vomiting, an active purgative; afterwards vinegar and water, or water sweetened with sugar, and an addition of ether. After the evacuations, laudanum.
POISONOUS SERPENTS: The viper or adder, rattle-snake, &c.	A sharp pain in the wounded part, soon extending over the body; great swelling; first hard and pale, then reddish; faintings, vomitings, convulsions; inflammation, often extensive suppuration, gangrene, and death.	A moderately tight ligature to be applied above the bite, and the wound left to bleed, after being washed with warm water. The actual cautery, lunar caustic, or butter of antimony, to be applied; then lint dipped in equal parts of olive oil and spirit of hartshorn. Ligature to be removed if the inflammation be considerable. Warm diluting drinks, with small doses of ammonia or hartshorn, to cause perspiration. The patient should be well covered in bed, drinking occasionally warm wine. If gangrene threaten, wine and bark must be freely given.
SPANISH FLIES.	Nauseous odour of the breath, burning heat in the throat and stomach; vomiting, often bloody; painful priapism, heat in the bladder, convulsions, delirium, death.	Vomiting, freely excited by sweet oil, sugar and water, or lintseed tea; emollient clysters. Camphor dissolved in oil may be rubbed over the belly and thighs.
VENOMOUS INSECTS: Tarantula, scorpion, hornet, wasp, bee, gnat, &c.	In general, only a slight degree of pain and swelling; sometimes sickness and fever.	Hartshorn and oil, salt and water: a few drops of hartshorn may be taken internally in a glass of water. The sting may, in general, be removed by making a strong pressure over it with the barrel of a small watch-key.

In many cases of poisoning, emetics are necessary, in order to remove the poison from the stomach. It has, however, been proved, that a late invention,

The STOMACH PUMP, is much more expeditiously effectual than emetics, and is now very often resorted to by medical practitioners for such purposes; but the use of this instrument can scarcely be confided to inexperienced hands.

POISON *from the inhalation of, or being immersed in noxious* Gas. Whenever persons are found in a state of apparent death from being immersed in, or having inhaled noxious gas, whether from the fumes of burning charcoal, the exhalations of lime-kilns, the gas from fermentation, the choak-damp of mines, the gas from wells, or the gas in the lower parts of caverns, the following method must be pursued for their recovery.

Expose the patient to atmospheric air without any fear of the cold; remove all his clothes and place him upon his back, with the head and breast somewhat elevated so as to promote respiration. On no account administer tobacco fumigations or place the sufferer in a warm bed. Give a few glasses of lemon-juice and water, or vinegar weakened by the addition of three parts water; sprinkle the body, particularly the face and breast, with cold vinegar; after this rub the body with cloths steeped in vinegar, camphorated spirits of wine, or any other spirituous fluid; at the end of two or three minutes wipe the parts which have been wetted with a warm towel, and after the interval of two or three minutes recommence the sprinkling and rubbing with cold vinegar and spirits. These means must be persevered in for some time. Irritate the soles of the feet, and palms of the hands, and the whole course of the back with a brush; administer a glyster consisting of one part vinegar and two parts water; after a few minutes administer another prepared with two ounces of common salt and one ounce of Epsom salts dissolved in water. Irritate the nostrils by a little roll of paper or a feather; or burning matches, or volatile alkali, taking care that the phial containing this last article be not held long at the nose. The lungs should be also inflated. All these methods failing, the patient should be bled in the foot if the face continue red, the lips swoln, and the eyes as it were starting from their sockets. Emetics should be avoided, except where persons recovering are troubled with excessive nausea; when the patient is restored to his senses he may be put into a warm bed in an apartment having all the windows open. He may then take a few spoonfuls of some good wine, as sherry or Madeira; the wine may be warmed and sugar added. It has often happened that five or six hours have elapsed before persons have been restored.

HYDROPHOBIA, or dread of water, is a disease, of which the fear of water is only a symptom, produced by the absorption of some poison accompanying the saliva of dogs, cats, and other animals in a certain state of disease. Hydrophobia is commonly produced by the *bite* of some animal, in general by that of the dog. The symptoms of a mad dog do not appear even now well defined; while some persons assert that mad dogs loathe water, others assert that they drink it freely; but, however, that this disease is peculiarly distinguished by a dread of water in man is unfortunately too abundantly confirmed. A variety of remedies have been proposed for this complaint; immersion in sea-water, bleeding to fainting, blisters to the part, caustics, &c.

We believe, however, that the most effectual remedy is, as soon as possible after the bite, to cut out the part bitten with a portion of the surrounding flesh, &c., and to apply the actual cautery to it. When this cannot be done, washing the wound well and often with vinegar and water, and afterwards applying some stimulating ointment to it to promote suppuration, are by all means desirable. The time in which this disease occurs, after the bite has been given, is very various; it has occurred sometimes as early as a week afterwards, oftener forty days, and in some it has been protracted for a year; but it usually comes on before the end of two months.

No certain remedy, after the disease has once evinced itself, being known, we can only advise that all dogs should be avoided; as we cannot know how soon or in what manner our coming in contact with them may inflict upon us the terrible chastisement of hydrophobia: for although the *bite* of a rabid animal generally produces the disease, it has occurred in man as well as other animals, cats, dogs, &c. without such a process of insertion.

SCALDS and BURNS. Although in general, such accidents, if serious, require the advice of a medical practitioner, yet here too, as well as in poisons, IMMEDIATE attention is of the utmost importance. One of the best remedies as well as one of the most simple for a scald, is wheat flour shaken over the part immediately and suffered to remain on it till the crust formed by the flour falls off. This application has been lately found more effectually to relieve the pain than any other known. Previously to this discovery it has been usual to plunge the scalded part into cold water or vinegar, and to keep it there for ten or fifteen minutes; the sooner this is done after the accident the better. A liniment composed of equal parts of lintseed-oil and lime water applied by cloths being dipped in it and folded round the part, or extract of lead and lime water, may be applied in the same way. A liniment of turpentine has also been recommended; this last however is esteemed the best for burns.

DROWNING. A few plain directions on this subject will not, we hope, be without their use. And first we may observe that those who bathe should be very careful, notwithstanding they swim ever so well, that there are no weeds in the water, or any thing else which may entangle the feet; nor should any one expose himself to danger unnecessarily; such as by plunging off heights into the water, nor by sailing in a boat except with some experienced person; nor should any one venture on the ice till he is assured it is sufficiently strong to bear him.

If, however, any one should fall into the water out of his depth, and cannot swim, impressed with the truth that the living human body is generally lighter than even fresh water, he should avoid all violent action, and calmly and steadily refrain from drawing in his breath while under water; the head should be raised as much as possible, and the hands and feet moved gently *in* the water, and not *out* of it, and there may be a great probability of the body being kept afloat until some assistance arrives. In such accidents the necessity of *keeping the hands down in the water* cannot be too strongly impressed upon the mind.

It being proved beyond a doubt that a person may remain a long time in water without being absolutely dead, we must not consign the body of a drowned person to death, notwithstanding appearances, till

we have adopted the means necessary for his recovery. The treatment should be begun the moment the body is taken out of the water, by removing all the wet clothes, if any, on the spot, and the body should be wiped dry, (unless some convenient house should be very near,) and a great-coat or two, or some blankets should be wrapped round it.

The body is then to be carefully conveyed, in a natural and easy position, to the nearest public house, where a good fire and a warm bed can be made ready for its reception. While being conveyed to this place, the head should be uncovered and a little raised, and the body rather inclined to the side. Great care must be taken that the body be not bruised nor shaken violently, nor in any other way roughly handled, nor carried over the shoulders with the head hanging down, nor rolled on the ground, &c.; such methods, formerly resorted to with the view of causing the water to flow out of the stomach, are decidedly injurious.

In cold or moist weather the body is to be laid on a mattress or bed before the fire, but not too near; or in a moderately heated room; in warm and sultry weather in a bed only. The body is then to be wrapped as expeditiously as possible in a blanket, and thoroughly dried with warm cloths or flannels. It should be laid on the right side, with the head and shoulders raised in a small degree; the mouth may be opened to allow the discharge of any fluid left therein.

In summer or sultry weather too much air cannot be admitted; the windows or doors of the room should be left open, and no more persons admitted than are absolutely necessary: more than six will be an incumbrance, and vitiate the air.

Care must also be taken that the body be not heated too suddenly. The warmth promising most success is that of a bed or blanket. Bladders or bottles of warm water should be laid upon the stomach, at the bottom of the feet, in the joints of the knee, and under the arm-pits; and a warming-pan, moderately heated, hot bricks wrapped in cloths or bags of hot ashes or sand should be rubbed over the body, particularly in the direction of the spine.

The natural and kindly warmth of a healthy person lying by the side of the body has been, in some cases, very efficacious. The shirt or clothes of an attendant, or the skin of a sheep fresh killed, may be also used with advantage.

Various stimulating methods may also be employed; volatile salts, spirit of hartshorn, the fumes of burning sulphur, or other stimulating substances, should be applied to the nostrils; or they may be irritated with a feather or other light body.

The lungs also should be inflated by applying the pipe of a pair of common bellows a little way up the nostril, at the same time the other nostril and the mouth must be closed by one of the assistants, whilst another gently presses the chest with his hands, after the lungs are observed to be inflated. By pursuing this process, the noxious vapours will be expelled from the lungs, and the natural breathing imitated.

General frictions should also be employed with warm flannels, a dry brush, or the hand, in order to increase the warmth of the body, and to assist the circulation of the blood.

When neither bellows nor other apparatus for inflating the lungs

can be had, it will be highly proper to excite the natural breathing by pressure on the breast, ribs, and lower parts of the belly by the hands, so as to press out as large a portion of internal air as possible; and then *removing* and *applying* the pressure alternately, in order to imitate the natural breathing.

In some instances agitation of the body, particularly of children, during the other resuscitative processes will be of service; in those, frequent and long-continued agitation of the legs and arms have been most beneficial.

In a work of this nature we cannot enter more minutely into this subject; and we conclude, besides, that in all accidents of this kind the best medical advice will be at once, if possible, obtained.

Neither the injection of the smoke of tobacco, nor clysters of that plant, although recommended by some persons, are of any use, but may prove deleterious. It is true that *clysters* of another kind may sometimes be of service; and also *bleeding;* but both these will require more judgment and skill in their application than usually accompanies ordinary persons.

In conclusion we must add, that it has occasionally happened after the lapse of *eight or ten hours* from the period of the accident, that animation has been, and probably might be restored.

END OF THE FIRST PART.

PART II.

Articles of Commerce including Manufactures, derived from the Three Kingdoms of Nature.

METALS.—A metal is a simple, opaque, shining, dense, fusible body. Seven metals only were known in very remote ages; these were *Gold*, represented under the symbol of the Sun ☉; *Silver*, the Moon ☽; *Mercury*, Mercury ☿; *Copper*, Venus ♀; *Iron*, Mars ♂; *Tin*, Jupiter ♃; *Lead*, Saturn ♄. Modern discoveries have added considerably to the number; among these the most important are *Platinum*, *Zinc*, *Bismuth*, *Antimony*, *Arsenic*, *Cobalt*, *Manganese*, *Iridium*, *Tungsten*, *Chromium*, &c. To these may be added *Potassium*, and *Sodium*, and many others, as *Calcium*, &c. constituting the bases of the earths. The number of bodies now known, and considered by chemists as metals, are forty-two. All the metals formerly known, and many of modern discovery, are very much heavier than water; but potassium and sodium, in particular, are lighter than that fluid.

Zinc was not known to the ancients, although they probably knew its ores as forming brass when fused with copper: the term *Zinc* first occurs in the writings of Paracelsus, who died in 1541. *Bismuth* was mentioned by George Agricola about 1530. *Antimony* was obtained pure in the 15th century. *Arsenic* and *Cobalt* were discovered by Brandt in 1733; their ores were long before known; *Platinum* was first recognized in 1741, by Mr. C. Wood; *Nickel* in 1751; *Manganese* in 1774; *Tungsten* in 1781; *Tellurium* and *Molybdenum* in 1784; *Uranium* and *Titanium* in 1789; *Chromium* in 1797; *Columbium* in 1802; *Palladium*, *Rhodium*, *Iridium*, and *Osmium* in 1803; *Cerium* in 1804; *Potassium* and *Sodium*, by Sir H. Davy, in 1807.

PLATINA or PLATINUM, is a metal, which in most of its properties is equal to gold, but in others it is very superior. It was named white gold from its weight and indestructible nature. Soon after its discovery, it obtained, from its colour, the name of *platina*, signifying little silver, from *plata*, which is Spanish for silver. Platina is found in small grains in South America, confined to alluvial strata in New Granada. Platina ore is generally mixed with other metals, *gold*, *iron*, *lead*, *osmium*, *iridium*, *rhodium*, and *palladium*. This grayish white metal being heavier than gold, equally exempt from the action of acids, although somewhat less ductile, is found of great service for chemical purposes, as crucibles, &c.; and for domestic use it is much more durable than either gold or silver. It is also exceedingly elastic. Its specific gravity is 21.5. The alloys of this metal with steel promise to be of use in the arts. A combination of 7 parts of platinum, 16 of copper, and 1 of zinc, much resembles gold.

IRIDIUM, as well as *osmium*, *rhodium*, and *palladium*, is found in the ore of platinum. It is of a whitish colour, and from the latest ex-

periments must be the heaviest metal known, its specific gravity being, when hammered, 23°. Its ordinary specific gravity does not appear well determined; it is however above 18°. An alloy of *osmium* and *rhodium* is 19.5. Although the specific gravity of rhodium is stated to be only 10.65, that of osmium does not seem to be known. Iridium combines with other metals forming alloys. Its most marked character is its extremely difficult solubility in acids. It was discovered by Mr. Tennant in 1803.

GOLD is of a deep yellow colour; it was thought to be not only the purest, most ductile, and shining, and on these accounts the most valuable of metals, but also the heaviest, till platina was discovered, which exceeds all others in specific gravity, except, perhaps, iridium. All the known parts of the earth afford gold, but not in equal purity or abundance. Europe furnishes but little. That from Asia is esteemed the finest. America furnishes the most, chiefly from the mines of Peru and Chili. The largest lump of gold ever known was obtained in the county of Wicklow, in Ireland; it weighed twenty-two ounces. Africa furnishes also very pure *gold dust*. Though gold is chiefly found in mines, some is found also in the sand and mud of rivers and torrents. The manner of refining and purifying gold will be noticed under the head of manufactures. The specific gravity of gold is 19.30.

SILVER is white, and the finest, purest, most ductile, and most precious of all metals except platina and gold. There are *silver mines* in all the four quarters of the world.—Europe has its share,—our own island is not quite destitute of them, though they are of little value. The mines of Peru and other parts of America are by far the richest,—they appear almost inexhaustible, particularly those of Potosi. Many Indians have perished in them, and great numbers continue to be destroyed yearly: the exhalations arising from them being very poisonous. Silver is found native, and in a variety of combinations; *native silver* has the general character of the pure metal. The method of separating silver from the ore is with quicksilver, the same as that of gold. The specific gravity of silver is 10.5.

LEAD is a coarse, heavy metal, of a grayish colour, and of all others the softest, when purified. Lead is found in various countries, but abounds particularly in England. It is found too in several kinds of soils and stones, some of which besides contain gold, some silver, others tin. Its specific gravity is 11.35. If melted lead be poured into a box, previously rubbed with chalk, to prevent its action on the wood, and be continually agitated, it will concrete into separate grains, of considerable use in various mechanical operations, particularly that of weighing. Lead, being easily oxidized, increases considerably in weight, either in the open air or on the ground. All the preparations of lead are more or less poisonous. *Red lead* and *litharge* are combinations of oxygen with lead; *white lead* is a carbonate of lead. Lead is not perfectly innocent, even for water-pipes, and much less so for any other kind of vessels. The workmen in any of the preparations of lead are subject to colics and paralytic disorders. Galena is a native sulphuret of lead found in cubical crystals; it is the only lead-ore which is worked, and mostly contains silver.

COPPER is a hard, heavy, reddish, ductile metal, found in mines in several parts of Europe, but mostly in Sweden. In Germany there are also mines of copper ore, and we have some in England not in-

ferior to the finest Swedish ones. Copper is found both in dust and stones, each of which are first well washed to separate them from the earth. Copper pyrites, or yellow sulphuret of copper, is that from which most of the copper of commerce is derived; it is the principal product of the Parys mountain in the Isle of Anglesea. Its specific gravity is 8.8; it is the next hardest metal after iron and platina. It readily mixes in fusion with either gold or silver, and is the best alloy for both. It is malleable much more easily than iron, though not so readily as some of the other metals. It is ductile to a very great degree, although inferior in this quality to gold, platina, silver, and iron. In its pure state we see it drawn out into extremely fine wire, and in the form of brass, in which it is altered in colour by an admixture of zinc. A copper wire one-tenth of an inch thick will support 488 pounds. It is also beaten into leaves, which, though not so thin as those of gold, serve for many purposes in their stead. In tenacity it is next to iron. It is the most sonorous of all metals, and forms the basis of most of the compound metals in which this quality is expected. It requires less heat to melt it than iron, nickel, gold, or silver. It combines readily with oxygen and acids; all its combinations with which are poisonous. The extreme divisibility of this metal almost exceeds imagination. A grain of it dissolved in alkali will give a sensible colour to more than 500,000 times its weight of water. To obtain copper from the ore, the latter is washed, powdered, and smelted, by means of black flux, and the metal is found at the bottom of the vessel, when cold, in the form of a solid mass, which may be further refined by repeating the operation.

ZINC, sometimes called *spelter*, is hard, bluish-white, and brilliant. At the temperature of 300° it is malleable, but when its temperature approaches fusion, which is about 680°, it is very brittle. Its specific gravity is 7. It expands more by heat than any other metal except mercury. It is found in various parts of Great Britain in the state of oxide called *calamine;* in New Spain, Poland, Germany, &c. Zinc combines readily with copper, and thus forms some of the most useful of all the metallic alloys. When the alloy contains three parts of zinc and four of copper, it assumes a colour nearly the same with gold. It is then called pinchbeck, prince's metal, or prince Rupert's metal. Zinc dissolved in sulphuric acid forms the sulphate of zinc, white vitriol, or white copperas of commerce. The mineral called BLENDE, mock-lead, false-galena, or black-jack, is an ore of zinc, containing generally about one half zinc, one fourth sulphur, and the remainder copper, iron, and lead. This metal is, next to manganese, (always excepting potassium and sodium,) the most susceptible of oxygen. Three parts nitre and one of zinc, being inflammed, burn with excessive splendour, and throw out sparks like stars, for which reason they are used in the finest fire-works. The *tinning* of common pins is also effected by the affinity of this metal. Layers of brass pins are placed in a vessel between plates of tin; a solution of cream of tartar is then poured over them, when the acid dissolves the tin, the zinc in the brass precipitates it on the pins, and by this means, after four hours' boiling, they are uniformly tinned over.

BRASS is formed of a mixture of copper and zinc, or its ore, calamine. Pure brass is not malleable, unless when hot, for when cold it will break. In order to render it in a condition to be wrought, seven poundsof lead are put to a hundred-weight of brass, which makes

it more soft and pliable. Copper melted with fine tin makes *bell-metal;* an equal quantity of brass and copper melted makes what is called *bronze* for statues, &c.

TIN is a white metal, softer than silver and harder than lead. The native oxide is the principal ore of tin which is found in Spain, Saxony, France, the East Indies, and South America; and in Cornwall and Devonshire, whence the greatest part of the tin consumed in Europe is procured. Camden supposes the abundance of tin in these two provinces to have given the name Britain to the whole country. In the Syriac language *varatanac* signifies land of tin, from which Bochart derives the name Britain. The principal properties of tin are, that it is very flexible, next to lead in softness, and the most fusible of all the common metals, except mercury. It is of great use for coating the inside of copper vessels for culinary purposes; but as thus it constitutes only an imperfect protection from the poisonous qualities of the copper, it is much better applied on thin sheets of iron, forming what are called tin-plates, of which the *tin-ware*, now chiefly used for the common purposes of the kitchen, is made. Its specific gravity is 7.30. It melts at 440°.

PEWTER is a bluish-white factitious metal, formerly much used in making domestic utensils, as plates, dishes, &c.; but at present for little beside beer-pots and wine-measures. This metal is a composition into which the following metals are said to enter; namely, tin, lead, regulus of antimony, bismuth, copper, and even brass, so that the qualities of pewter are found almost innumerable; lead being the cheapest ingredient, we may be certain it is found in it in pretty large quantity.

IRON is the hardest, most elastic, tenacious, most useful and plentiful of all metals; it is of a bluish-white colour, very malleable, ductile, and fusible, but at a temperature next to platina; it may be softened by heating it in the fire, and is hardened by immersing it in cold water; iron has a great affinity with copper; and the two are not easily separated when soldered together. The specific gravity of iron is 7.78. The loadstone is an iron ore. There are several kinds of iron. English iron is fittest for fire bars, and such uses. Swedish iron is of a fine sort, highly malleable and best to work on. Spanish iron would be equal to the Swedish, were it not subject to crack when between hot and cold. The German iron called *dortsquare* is a coarse iron fit only for ordinary uses. The iron of which wire is made is the first that runs from the mine-stone when it is melting, as it is the softest and toughest. We have a great number of iron works in most parts of England and Wales; those of the Forest of Dean in Gloucestershire, and Colebrook Dale in Shropshire, have been long in great repute. The native combinations of iron, whence the chief supply of commerce is drawn, are the oxides and sulphurets. Iron is sometimes found *native*, and is considered of meteoric origin, it being invaribaly alloyed with a portion of nickel; *meteoric stones* are a similar composition. One of these found in Siberia by Pallas weighed 1500 pounds; another mass found in Peru weighed 15 tons! Iron is very liable to contract *rust*, or become oxidated by absorbing oxygen from water or air. Conte informs us, that if fat oil varnish be mixed with about half its weight of oil of turpentine, (both being entirely free from water,) and thus be applied lightly and evenly with a sponge to iron or steel, and left to dry, the metal will retain its lus-

tre, without any danger of rusting. The uses of iron in the arts are innumerable; it also, in combination with acids and with oxygen, supplies us with valuable medicines.

Iron-moulds or stains may be removed by lemon juice or oxalic acid. *Ink spots* may be removed by the same means. If the iron-mould have remained so long that it is insoluble in the acid, a solution of an alkaline sulphuret may be applied, and after this has been well washed off, the acid will remove the stain, provided the fibre of the threads of the cloth be not impaired, and if so the spot will leave a hole.

Cast-iron is iron combined with carbon and some earths. *Wrought-iron* is iron deprived of its carbon and earthy matters; hence it is iron in its purest state.

STEEL is pure iron impregnated with carbon, the proportions being variable, which renders it whiter, and its grain closer and finer than common iron. Steel is heavier, takes a finer polish, and is less apt to rust than iron. It is susceptible of a high degree of hardness, by immersing in water when ignited. No other metal is equal to it in elasticity. *Wootz* or *Indian steel* is very valuable for cutting instruments; the cause of its superiority unknown.

MAGNET, or LOADSTONE; a sort of ferruginous stone, or species of iron ore, which it resembles, though somewhat harder and more heavy, endued with extraordinary properties. The most distinguished of these properties are, that it points toward the poles of the world, that it attracts iron, and that it also communicates these properties by touch to iron; in this manner is formed the mariner's needle. The attractive power of the magnet was known to the ancients, and is mentioned by Plato and Euripides, who call it the *Herculean stone*, because it commands iron, which subdues every thing else. But the knowledge of its directive power, disposing needles and pieces of iron to point along the meridian of every place nearly to the north, is of a later date, though the exact time is still unknown. The loadstone is usually found in iron mines, and sometimes in very large pieces, about one half pure iron. Its colour is different, according to the different countries in which it is found. Norman observes, that the best kinds are brought from China and Bengal, which are irony, or of a sanguine colour; those of Arabia are reddish; those of Macedonia blackish; and those of Hungary, Germany, England, &c., the colour of unwrought iron. Neither its figure nor bulk is determined; it is found of all forms and sizes. Almost all the magnets now in use are however *artificial*. Iron rods acquire magnetism by exposure in a vertical and many other positions, as well as by friction. See Barlow and Lecount.

The MARINER'S COMPASS consists of a circular brass box, which contains a paper card with thirty-two points or divisions of the circle, fixed on a magnetic needle which always turns to the north, excepting a variation at different places. The needle, with the card, turns freely on a pin fixed in the centre of the box. The top of the box is covered with a glass, that the card's motion may not be disturbed by the air. The chief points are, north, south, east, west; north-west, south-west, north-east, south-east, north-north-west, north-north-east, south-south-east, south-south-west; east-north-east, east-

south-east ; west-north-west, west-south-west. All the points are well shown in the following *face of the compass.*

Dipping-needles, instead of playing horizontally and pointing north and south, dip or incline downward to the horizon. The inventor of the dipping–needle was, without all question, Robert Vorman, an Englishman and compass-maker at Wapping, about the year 1576. The occasion of the discovery he himself relates ; that it being his custom to finish and hang the needles of his compasses before he touched them, he always found that immediately after the touch the north point would bend or decline downwards. The constancy of this effect led him at length to observe the precise quantity of the dip, or measure the greatest angle which the needle would make with the horizon.

OCHRE is a yellow, brown, or red, dry, friable substance, consisting generally of oxide of iron and alumina ; it is commonly in lumps, more or less large, and found in various mines. The chief use of the ochres is in painting. A delicate *red* ochre may be obtained by burning yellow ochre in a crucible. The best ochre is said to be that of Berry, in France ; but several good ochres are obtained in this country. *Oxford ochre* and *spruce ochre* are yellow ochres well known in commerce. The ferruginous ochres, which are most common, appear to

be produced by the decomposition of iron pyrites, which consist of sulphur and iron.

BLACKLEAD has long been known under the name of plumbago, or, in the modern language of science, *graphite*, or *carburet of iron*, its composition being iron and carbon. Blacklead is of a dark gray or blue colour, and has something of a metallic lustre. It is infusible, but will burn in a flame urged by a current of oxygen gas. The best blacklead is found in Borrowdale in Cumberland, where it is obtained in such plenty, that not only the whole Island of Great Britain, but the continent of Europe may be said to be supplied thence. Crucibles and retorts made of this substance will endure almost the strongest heat. The powder of blacklead is used in covering straps for razors; and with it iron stoves, &c. are preserved from rust. *Cast-iron* by lying long in sea-water becomes converted into a substance similar to blacklead, so that it readily breaks, or may be easily cut with a knife.

MERCURY, or QUICKSILVER, is a metal, fluid at a very low temperature, and resembling silver in fusion. From this property it has received several denominations; among the ancients it was called hydrargyrum, or water of silver. Many of the alchemists called it also Proteus, from the variety of forms, colours, &c. it passed through in their examination. Of all bodies it is the heaviest after platina, iridium, gold, and tungsten. Its specific gravity, in its usual state, and at a common temperature, is 13°.5; but made solid by being cooled to 40° below 0° of Fahrenheit's thermometer, its specific gravity is 15°.61. Mercury itself dissolves gold, silver, tin, and other metals, and if properly combined with them in sufficient quantities, the mercury loses its fluidity, and forms an amalgam. It is this quality of forming an amalgam, and its being easily separated again by fire, which reduces it to pure mercury, that makes it so important, and even necessary to the refining of ores in gold mines, to gilding, to the fixing of tinfoil on glass for mirrors, and many other purposes. There is no other metal which affords such an extraordinary, and in some respects almost inexplicable variety of oxides as mercury: exposed to acids, it yields bright red, white, yellow, and black salts or oxides, most of which are used in medicine. On being exposed to a heat of 670°, it rises in a vapour scarcely perceptible by the eye; but in whatever manner in may be divided, it still retains its nature, and is the same specific fluid. It becomes solid by cold at 40° below 0° when it is malleable and flexible. The chief mines of mercury are those of Germany, Hungary, Spain, and Peru. The greatest part of our quicksilver is brought from Germany, some from the East-Indies. It is found under three several forms:—in ruddy masses, called native cinnabar, a sulphuret of mercury, whence most of the quicksilver of commerce is obtained; in hard stony glebes, of a saffron colour; and also in a pure state: for upon opening holes in the beds of stones, there sometimes gushes out a vein or stream of pure mercury, called virgin mercury.

ARSENIC is a brittle, bluish white, volatile, and highly inflammable metal. Its specific gravity is 8.3. It readily melts, and may be distilled at a temperature of 360°. Its vapour has a very strong smell resembling that of *garlic*. This metal and all its compounds are virulent poisons. What is commonly called *arsenic* is a compound of the metal with oxygen, called the *arsenious* acid, or *white oxide of arsenic*;

it is white, semi-transparent, brittle, and of a vitreous fracture. When in powder it appears of a dull white; its specific gravity is 3.7. Yellow arsenic, auripigmentum, or *orpiment*, is a sulphuret of arsenic. If a smaller quantity of sulphur be combined with the arsenic, the result is a red sulphuret, termed *realgar*. Both the latter are sometimes called orpiment, being distinguished by the terms red and yellow. All these three are found native, and may be formed by art. If arsenic be burnt, it emits a bluish white flame, a garlic smell, and a white smoke. For the remedies for the poison of arsenic, see our article POISONS, in Part I. Arsenic is found in most parts of the world; but the greater part of the arsenic of commerce is obtained from Bohemia and Saxony, where it is procured from arsenical cobalt ores, by roasting them in reverberatory furnaces. This metal is used by dyers, glass makers, &c.; and for glazing earthenware.

NICKEL is a silvery white metal, possessing magnetic powers like iron; its specific gravity is 8.5. It is malleable, but difficultly fusible, yet it absorbs oxygen readily when red-hot. The oxide of nickel gives a find hyacinth colour to glass, for which it is used in making artificial jewels. Nickel is always found in meteoric iron.

COBALT is a reddish gray metal, brittle, and as difficult to fuse as iron. Its specific gravity is 7.7. This metal yields fine colours to the painter, and for sympathetic inks. A precipitate of cobalt by a potash ley from nitro-muriatic acid and nitrate of zinc, is a beautiful green. The ores of cobalt, which usually contain arsenic, are torrefied in Saxony in furnaces, where the arsenical vapours attaching themselves to the sides, the arsenic of commerce is produced. When the oxide of cobalt is cleared of arsenic and sulphur, and mixed with about twice its weight of finely powdered flints, it is known by the name of *zaffre*. This substance exists native in Spain and the south of Ireland. Zaffre fused with three parts sand, and one of potash, forms a blue glass, which, when pounded, sifted, and reduced to powder, is known by the name of *smalt*. The blue glass is used for enamel painting, and the smalts for clear-starching linens. Smalts, divested of their grosser particles by water, are called *azure*. Powdered cobalt inflames if thrown into oxygenated muriatic acid gas, or *chlorine*, as it is now called.

MANGANESE is a bluish white metal, very brittle, nearly as difficult to melt as platina, and absorbing oxygen from the atmosphere so rapidly, as to change from white to red and black oxides. Its specific gravity is 8. The black oxide of manganese is used for obtaining chlorine, formerly called *oxymuriatic acid gas*, from sea-salt, for the modern process of bleaching. It is also used as an abundant source of oxygen. This oxide is found in Devonshire, Somersetshire, and Aberdeenshire. It has the remarkable property of freeing glass from colour when fused with it, whence it has obtained the name of *glass-maker's soap*; and is employed in black glazing for pottery ware.

ANTIMONY is a metal of considerable use in medicine and the arts. It is of a silvery white colour, brittle, and crystalline in its ordinary texture. It melts at 800°, and is volatile at a high heat. Its specific gravity is 6.7. When melted, it emits a white fume, called flowers of antimony: these are evidently a sublimed oxide of antimony, which dissolves in water, and approaches to the nature of an acid. Antimony is found in Germany, France, and England; that obtain-

ed in this country is said to be mixed with portions of lead. Antimony is found in commerce in two different states. *Crude antimony* is a sulphuret of antimony, and only separated from its matrix : *regulus of antimony* is the purified metal. The flowers of antimony are capable of being converted into a fine glass of a hyacinth colour. This glass is used for enamel, colouring glass ornaments, painting on china, &c. ; and when levigated and boiled with cream of tartar, it constitutes the emetic tartar of the shops. Dr. James's fever powder is supposed to be an oxide of antimony combined with calcareous phosphate. It would, however, exceed our limits to mention all the preparations of antimony, called butter, glass, cinnabar, crocus, liver, calx, golden sulphur, kermes mineral, bezoar, &c. of antimony. The perpetual cup and pill were formerly much used in medicine. These were made of the pure metal cast into the shape of a cup and a pill: the cup imparted an emetic quality to wine suffered to remain in it a little time, without any apparent diminution of its substance for ages ; and the pill, although it often proved emetic, might be transmitted from generation to generation as a purgative. Antimony is used as an alloy in printers' type metal, small shot, mirrors of telescopes, and scorifying copper, &c.

BISMUTH, or *tin-glass*, is a brittle white metal, with a slight tint of red, usually found in silver and tin mines. Native bismuth generally contains arsenic, sometimes cobalt. Bismuth has been found in Cornwall, Germany, France, and Sweden. Its specific gravity is 9.8. It fuses at 476°, and always crystallizes in cooling. Eight parts of bismuth, five of lead, and three of tin, constitute the *fusible metal*, called, after its discoverer, Newton's, which melts at the heat of boiling water, and may be fused over a candle in a piece of stiff paper without burning the paper. Bismuth is also used for pewter, soft solder, printers' types, &c.: mixed with gold, platinum, and silver, it forms brittle compounds. *Magistery of bismuth*, or *pearl white*, is well known to the ladies as a cosmetic. Bismuth is also used in sympathetic ink and dyeing. The oxide of bismuth has been lately given in small doses advantageously in some serious cases of dyspepsia. The London College has also introduced a sub-nitrate of bismuth into their pharmacopœia.

TUNGSTEN may be mentioned as being the heaviest of the metals, next after iridium, platinum, and gold, its specific gravity being 17.5. It is difficult of fusion, very hard, brittle, and of an iron colour. It is obtained by exposing a mixture of tungstic acid and charcoal to a strong heat. Peroxide of tungsten, or *tungstic acid*, may be obtained from two native combinations, *wolfram*, which generally accompanies tin ores, and *tungstate of lime*. Peroxide of tungsten is tasteless, and insoluble in water; its specific gravity is 6. Wolfram abounds in Cornwall ; tungstate of lime in England, Sweden, and Saxony. This metal and its acid have been hitherto little investigated.

CHROME or CHROMIUM is a metal in colour resembling iron ; it is brittle, and difficult of fusion ; its specific gravity is 5.9. The *red peroxide of chrome*, or *chromic acid*, is most easily procured by the decomposition of native *chromate of lead ;* this substance is found in Siberia ; but on account of its scarcity and high price its use as a pigment was till lately confined to portrait painters. It is now however produced artificially in this country, and sold under the name of

chrome yellow, and used by coach-makers and house-painters in considerable quantities.

TAMBAC or TOMBAC; a mixture of gold and copper, which the people of Siam hold more beautiful, and set a greater value on than gold itself. Some travellers speak of it as a metal found in its peculiar mines. The metal now generally called tombac is a white alloy of copper with arsenic, either brittle, or ductile and malleable, in proportion to the greater or less portion of arsenic which it contains. It is sometimes called white copper, and is manufactured into buttons, thimbles, &c.

TUTENAG is a name given in India to zinc; it is also applied to a white metallic compound, brought from China; it does not tarnish more than silver, and is said to be composed of copper, zinc, and iron.

Fixed Alkalies; Tartar.

From the brilliant discoveries of Sir H. Davy, the bases of the fixed alkalies must be ranked under the class of metals; but as the alkalies themselves will still be known in commerce by the names of potash and soda, we shall consider them under their ancient names.

POTASH is obtained by washing the ashes of burnt vegetables, or of the lees of wine in water, and evaporating the lixivium in iron pots. The salt thus obtained is the common potash of commerce, of a dark grey colour, and containing much extractive matter. This salt is still further refined by exposure to a great heat in a reverberatory furnace, which dissipates the water, consumes the extractive matter, and reduces the weight of the mass about 15 per cent. During this process great care is taken to prevent the fire from melting the potash, and hence forming a kind of glass; and when the fire has been continued a sufficient time, the potash is found purified into the fine white salt, called from its lustre pearl-ash. This substance is at first very hard, but on exposure to the air it imbibes moisture rapidly, becomes soft, and finally liquefies: if adulterated with lime, as it very generally is, it falls into a powder. Potash, when brought into the sphere of a very powerful galvanic pile by Sir H. Davy, and exposed to an intense heat, was divested of its oxygen, and converted into a metallic mass of the shape and colour of globules of mercury, and so very light were these globules that they floated in naphtha. In no other fluid could this new metal, called *potassium*, be preserved, as it imbibed oxygen so rapidly from air, water, or spirits, as to be instantly reconverted into alkali. See Part I.

TARTAR is a crystalline salt deposited in wine casks during the fermentation from the juice of the grape, in which it exists in considerable quantity. Tartar is found in commerce of two kinds, they are commonly called *argol*, and distinguished by their colours into *red* and *white*. Both are *bitartrates* or *supertartrates of potash*. Tartar is used for various purposes in the arts, chiefly in dyeing; when purified by solution and crystallization it is white, and termed *cream of tartar*.

Tartar exposed to heat, fuses and is decomposed, the *acid of tartar* being driven off, and a *carbonate of potash*, or as it is still called in familiar language *salt of tartar*, is the result; it is precisely the same as that obtained from purified potash.

Oil of tartar is water fully saturated with carbonate of potash.

Emetic tartar is composed of tartaric acid and antimony; see ANTIMONY.

SODA is sometimes found native, but most generally is obtained by burning maritime plants, particularly salsola. The *barilla* brought from Spain, and the *kelp* prepared on our own shores, are impure soda, and may be refined in the same manner as potash. Soda differs from potash in not being deliquescent, but in efflorescing in the air, and also in forming with acids various neutral salts, of which common salt and Glauber's salt are not the least important. One of the chief uses of soda is in the manufacture of soap. See SALT and ALKALI in PART I.

MIXED EARTHS, OR CLAYS.

The general characters of the Simple Earths have already been noticed; as alumina or argillaceous earth, lime, silica or silex, magnesia, baryta, strontia, glucine, zircon, and yttria. Different proportions of some of these hitherto deemed simple substances, or primitive earths, enter into all the known minerals and precious stones. Here we shall only notice such Mixed Earths or Clays as are used in their native states, in manufactures, or as manures, &c.

FULLER'S EARTH is of a greenish white colour, varying with other shades of green; it feels greasy, is softer than chalk, and may be easily cut; it falls into powder with water. It consists of salica, alumnia, magnesia, oxide of iron, a very small portion of muriate of soda, a trace of potash, and a considerable quantity of water. It is of great use in the woollen manufacture, serving to scour cloths, stuffs, &c. Fuller's earth is dug in great plenty out of certain pits near Brick-Hill in Staffordshire, and Hampshire. As it is necessary to the dressing of cloth, foreigners are very desirous of this article. For this reason it is made a contraband commodity; and the export made equally criminal with that of exporting wool. Abroad they make great use of urine instead of fuller's earth. Sir H. Plat and others reckon it a great improver of land. When dissolved in vinegar it disperses pimples; it checks inflammations, and cures burns.

MARL is of various kinds, consisting of clay mixed either with fuller's earth, or with calcareous earth. It is an excellent manure, and is divided by English farmers into five sorts; the coroshut marl, which is brown, mixed with fragments of chalk and blue veins; the stone, slate, or flag marl, resembling blue slate, and crumbling easily when exposed to the air; pont or delving marl, which is brown and rough to the touch; clay marl, which contains much clay; and steel marl, of a black colour, and consistence like that of bits of paper. The Lemnian Earth, till lately sold in Europe under the seal of the Grand Seignior as a medicine, may be ranked among the stone-marls.

CHALK is a white, very soft, friable carbonate of lime, containing about 40 per cent. of carbonic acid, which is more than any of the other calcareous stones. A little siliceous earth and alumina are also found in it, and sometimes muriate of magnesia. There are several kinds of chalk. A hard, dry, strong chalk is used for making lime; and a soft, unctuous chalk used to manure lands, as easily dissolving with rain and frost. It is said that in cold, sour ground, it promotes the yielding of corn; that it sweetens grass so as to

cause cattle to fatten speedily, and cows to give rich milk. The best method of using chalk as manure is to mix one load of it with two loads of dung or mud. The methods of chalking lands vary however exceedingly: some lay only twelve or fourteen loads of chalk upon every acre, and this will sometimes make the land bring very rich crops for many years; but it is laid on very often in much larger quantities; in some districts from sixty to one hundred loads per acre. But the most beneficial mode of applying it as manure is when it is converted into lime. In Kent they have an easy way of digging chalk. It lies on the sides of the hills, and the workman undermines it as far as he thinks proper; then digging a trench at top, he fills it with water, which soaks through in the space of one night, and the whole flake falls down at once. Chalk combines with most acids, forming with them neutral salts. It is used with success to absorb acidity in the stomach, commonly called the heart-burn. Powdered chalk is given with milk to prevent its growing acid on the stomach; and externally it is recommended for drying ulcers and fissures in the nipples.

Red Chalk is a clay coloured by the oxide of iron, of which it contains about eighteen parts in one hundred; its chief use is for pencils and other writing where a red colour is desirable; it comes from Silesia.

French Chalk has a whitish slaty appearance; its use is chiefly as a writing material.

Black Chalk, or Drawing Slate, is grayish or blueish black. It consists of silex, alumina, carbon, and oxide of iron. The principal fracture is glimmering and slaty, the cross fracture dull. It is in opake tabular fragments, stains paper black; easily cut and broken; specific gravity 2.4. The best kinds come from Italy; it is also found in France, Spain, and the Isle of Isla in the Hebrides. It is used in crayon drawing, whence its name.

CLAY. There is a great variety of earths or clays denominated after the particular use to which they are applied, as PORCELAIN CLAY, which consists of alumina and silex, with a little mica, and is found in Cornwall, Saxony, Japan, and China. It is of a reddish white, is supposed to be formed from the decomposition of felspar, and is used in the manufacture of porcelain or china. PIPE CLAY is of a grayish or yellowish white. POTTERS' CLAY is found of various shades of yellow, gray, green, and blue. The most durable kind of bricks are made of a YELLOW CLAY containing some iron, and a considerable portion of silex.

BOLE, *Bole Armenic*, or *Armenian Bole*, is a soft, friable fat earth, of a pale red colour, easily pulverized, and which adheres to the tongue; it was formerly used in many diseases externally and internally, it is now given occasionally in diarrhœas. Bole of the Levant is an earth nearly of the same nature. Some think that it is the Levant bole, which passes among us for the Armenian. *French Bole* is also sometimes heard of; it is variegated with colours of red and white.

COAL AND OTHER BITUMINOUS AND INFLAMMABLE SUBSTANCES.

BITUMENS are fossil substances bearing considerable resemblance to oily and resinous bodies.

COAL is the most general and useful of all fossil and inflammable bodies. From the abundance of vegetable bodies with which coal is often associated, the gradual transitions of wood into coal, discoverable in many parts of the world, and an examination of lumps of coal, upon fracture, there is every reason to conclude that coal is the product of submerged vegetable matter, particularly the leaves and trunks of trees. Wood is converted into coal by sulphuric acid, and burns like mineral coal devoid of bitumen. BITUMEN is supposed to be a modification of the resinous and oily parts of vegetables, produced by some process of nature operating slowly on immense masses. There are *three* varieties of coal; the first, or *Brown coal*, retains some of the vegetables whence it has originated; it is generally of a tough consistency, and yields vegetable extract and resin. *Black coal* is that which forms our ordinary fuel. It consists principally of bitumen and charcoal in variable proportions. *Glance coal* consists almost entirely of charcoal and earthy matter; it burns without flame, and when distilled produces scarcely any gaseous matter. Coal, by dry distillation, yields carbonate of ammonia, CARBURETTED HYDROGEN GAS, COKE, and an empyreumatic oil in the state of tar, called COAL TAR. COKE, burning without smell, flame, or smoke, is preferred to coal itself where great heats are required. *Carburetted Hydrogen Gas*, is used for *gas lights*, with which the streets of the metropolis and other cities of the British empire, and many shops, manufactories, and large buildings, are now lit. The *Gas-works* of the metropolis are now become interesting objects to the curious; the immense size of the gasometers, their number, and the apparatus of iron vessels filled with coal, and immersed in furnaces of intense heat, convey to the beholder some idea of Milton's Pandemonium.

Cannel Coal is black, and does not soil the fingers like common coal; from its regular texture it is made into snuff-boxes,. toys, &c. It is found in England, at Wigan, Brosely, near Sheffield, and Whitehaven; and at Gilmerton and Muirkirk in Scotland, where it is called *Parret Coal.*

Culm is another variety of glance coal which burns without flame or smoke, used in burning lime, &c. It is found in Wales and Ireland.

Jet is also a species of bitumen or coal, so called from the river Gaga, in Lesser Asia. It is distinguished by its splendid black lustre and conchoidal fracture. It is used for fuel and also for making snuff-boxes, &c. Jet is found in the Isles of Sky and Faroe, in Germany, &c. In Prussia it is called *Black Amber.*

Bovey Coal is of a brownish black colour, of a lamellar texture, and consists of wood impregnated with bitumen or petroleum, and containing pyrites and alum.

SULPHUR has been described in Part I.; which see.

NAPHTHA is a pungent odoriferous oily liquid, either colourless or of a pale brown tint, found upon the borders of the Caspian Sea, and in Italy. It is lighter than water, volatile, and highly inflammable. When pure it appears to contain no oxygen, and hence is employed for the preservation of potassium and the other highly oxidable metals. It consists of carbon and hydrogen.

PETROLEUM has most of the properties of naphtha, but it is less fluid and darker coloured; in countries where it abounds it is employed for burning in lamps; it is found dropping from rocks or issuing from the earth, in Italy and various other parts of Europe.

MINERAL TAR appears to be petroleum further inspissated; it is more viscid and of a deeper colour. *Barbadoes* tar belongs to this class; it comes from the island whose name it bears; it is occasionally used as a stimulating external application in rheumatism, &c. *Maltha* or *mineral pitch*, is a soft inflammable substance, heavier than water, and is, most probably, an exsiccation of mineral tar.

ASPHALTUM is found on the shores of the Dead Sea, in Albania, and Trinidad. It is brown or black, heavier than water, and soluble in naphtha. *Elastic bitumen*, or *mineral Caoutchouc*, is found only at Castleton in Derbyshire: it resembles, in its elastic properties, the substance whence it is named; it is fusible and inflammable. *Mineral tallow* resembles tallow, but is lighter than that animal production; it is found in Finland and Persia. *Resin Asphaltum* accompanies the Bovey coal of Devonshire; it consists of resin, asphaltum, and earthy matter. The elementary principles of bitumens are carbon and hydrogen.

PEAT and TURF consist principally of the remains of vegetables; they often contain bituminous wood, and branches and trunks of trees. The ashes of peat are used very extensively in some districts of this country as manure.

Gems and Precious Stones.

GEM is a common name for all precious stones or jewels.

The DIAMOND was, by the ancients, culled *adamant*. It is the first in rank, value, hardness, and lustre, of all gems. The goodness of diamonds consists in their water, or colour, lustre, and weight. The most perfect are white. Their defects are veins, flaws, specks, &c. In Europe the lapidaries examine the goodness of their rough diamonds by day-light. In the Indies it is done by night. Dr. Wall, in the Philosophical Transactions seems to have found an infallible method of distinguishing diamonds from other stones: a diamond, with an easy slight friction in the dark, with any soft, animal substance, as the finger, woollen, silk, or the like, appears luminous in its whole body; and if you keep rubbing it long, and then expose it to the eye, it will remain so for some time. Diamonds are found in the East Indies, in Golconda, Visiapour, Bengal, and the island of Borneo. The miners work quite naked, except a thin linen cloth before them; and they have also inspectors to prevent their concealing the stones; which, however, they frequently find means to do, by swallowing them when they are not observed. Diamonds have also been found in the Brazils, and hence the terms oriental and occidental diamond: the latter is esteemed the least valuable, but the constituent principle of both is the same. Modern chemistry has proved that the diamond is pure carbon, or very nearly so, and perfectly inflammable, as Newton concluded. Among the crown jewels of Russia is a diamond the size of a small pigeon's egg, formerly the eye of a Brahminical idol, whence it was stolen by a French soldier, and after passing through several hands, was purchased by the Empress Catharine for 90,000*l.*, and an annuity of 4000*l.* A beautiful diamond brought from India by a Mr. Pitt, was sold to the Duke of Orleans for 100,000*l.*

Diamonds are of distinguished use for cutting glass; as ornaments they are well known.

CRYSTAL, *Quartz*, or *Rock Crystal*, is a transparent stone, white like a diamond, but much inferior in lustre and hardness. It is used for vases, urns, mirrors, &c.—The ancients knew little of its nature. Pliny speaks of it as hardened petrified water. The finest specimens are brought from Madagascar and the Alps; fine crystals are also found at Clifton near Bristol, and in Cornwall: these are called *Bristol-stone*, and *Cornish Diamonds.* Fine crystals are sometimes used as a substitute for glass in spectacles; they are then termed *pebbles*, and do not so readily become scratched as glass. Its perfection consists in lustre and transparency: that with straw, dust, clouds, &c. is little valued. It is frequently found hexagonal; the edges inimitably fine and accurate. It is cut and engraved in the same manner as common glass, of which it was the prototype. Rock crystal may be considered as pure silica. There are yellow, green, blue, and violet crystals, called after the precious stones which they resemble, as green crystal is called false emerald. Quartz is the basis of many precious stones; *Flint*, *Chalcedony*, *Cornelian*, *Onyx*, *Blood-stone*, and *Agates*, consist chiefly of quartz, with different tinging materials.

CORUNDUM is a term applied to a genus of gems consisting of three species; viz. the *octohedral*, the *rhomboidal*, and the *prismatic.* Corundum is also called perfect and imperfect. The *Ruby*, *the Sapphire*, *the Oriental Topaz*, are perfect corundums. *Adamantine Spar* and *Emery* are imperfect corundums. ADAMANTINE SPAR, which is called corundum by the inhabitants of Bombay, is of two kinds: one, which comes from China, is gray of different shades, and so hard that it not only cuts glass as easily as the diamond, but marks rock crystal and several other hard stones. The second sort comes from India, and is of a whitish colour. From its hardness it is difficult to analyze it; but its chief ingredient appears to be alumina.

The RUBY is a red sparkling gem of the first rank among precious stones. It is found in Pegu and Ceylon, in Europe, particularly in Bohemia and Hungary, and in Brazil. Rubies can be so nearly counterfeited, that the lapidaries themselves may be deceived. When a ruby exceeds twenty carets it is called a CARBUNCLE, the name of an imaginary stone described by the ancients. They long supposed the carbuncle to be taken from the dragon's head, and we hear of many a cavalier who went to combat with dragons, on purpose to gain this invaluable jewel. Vartomen assures us, that the king of Pegu used no other light in the night-time but that of his carbuncle, which cast a blaze like that of the sun. The chief ingredient in the ruby is alumina; but the balass, or spinell ruby, consists of alumina, silica, magnesia, and iron, with traces of lime and oxide of chrome. See SAPPHIRE.

The EMERALD is a precious stone, very green and transparent, in hardness next after the ruby. There are two kinds, *oriental* and *Peruvian.*—The oriental is harder, more brilliant and transparent than the Peruvian, which has generally clouds found in it, and sparkles less.—The emerald is supposed to grow more and more perfect in the mine, like the ruby, and to arrrive at its greenness by slow degrees. The ancients supposed it of use in medicine, but it is now only valuable for its beauty. Authors mention emeralds of incredible magnitude; one, pretended to have been seen by Theophrastus in a temple in Egypt, four cubits long and three broad; and an obe-

lisk of emerald forty feet high. The emerald consists of silicia, alumina, and a peculiar earth called *glucine*, and lime.

The TOPAZ is the third order of gems after the diamond. It is transparent, and of a beautiful yellow or gold colour, very hard, and takes a fine polish. It is found in the Indies, Ethiopia, Arabia, Peru, and Bohemia; and is known in commerce by the names oriental Brazilian, and Saxon topaz. The oriental ones are the most esteemed; their colour borders on the orange: those of Peru are softer, but their colour nearly the same. The topaz is easily counterfeited, and there are factitious ones, which to the eye do not appear inferior to the natural ones. The topaz consists of alumina, silica, and fluoric acid. The topaz appears to be the true *chrysolite* of the ancients.

The CHRYSOLITE is the topaz of the ancients, while our topaz is their chrysolite. The modern chrysolite is of a dusky green colour, with a cast of yellow. Two kinds are known, the chrysolite of the jewellers, and Brazilian chrysolite: the former is of a greenish pale yellow; the latter of a golden yellow. Chrysolite is the least hard of all the gems. It consists of silica, magnesia, and oxide of iron. Found in Egypt, Ceylon, Brazil, Siberia, and Bohemia.

The SAPPHIRE, or *Rhomboidal corundum*, is of an azure or beautiful sky colour. It is transparent, yet so exceedingly hard, as scarcely to bear being engraven on. The deepest blues are called males, and the whitest females. Sapphire is also found red, gray, white, green, and yellow; but these, in common language, have different names, as the *ruby*, the *topaz*, and *amethyst*. The finest things, in the Hebrew, are called sapphires. The throne of God is said to resemble a sapphire; and the rabbins hold that Moses's rod, and the tables he received on Mount Sinai, were of sapphire. There are oriental, white oriental, Brazilian, and water sapphires. The constituents of sapphire are alumina in very large quantity, lime, and a very small portion of oxide of iron. Some rank the *cat's eye* in the number of sapphires. This gem has a remarkable diversity of colours, is very hard, and bears a polish equal to the true sapphire. The sapphires of Pegu are the most esteemed. They are found in the same mines with rubies. Some are also brought from Calicut, Ceylon, and Brazil. The soft water sapphires of Bohemia and Silesia are of some value, though far inferior to the oriental ones, both in their brightness and firmness. Some value the sapphire beyond the ruby, and give it the second place among precious stones.

The GARNET is of two kinds. *Precious* garnet, of a dark red colour, falling into blue; it is sometimes massive, sometimes crystalline, commonly in roundish grains: some pieces have been obtained as large as a hen's egg. The best is found in Pegu; it is also found in Scotland, various other parts of Europe, India, and Syria. It consists of about equal parts of cilica and oxide of iron, about one-fifth of alumina, with a small portion of manganese. *Common* garnet is usually red, brown, or green; it is massive, never in grains, yet sometimes crystallized, and possesses all the forms of *precious* garnet. In its composition it has less oxide of iron than that gem, the place of which is supplied by lime. It is found in Ireland, Norway, and elsewhere.

The AMETHYST, *Purple Quartz*, or *Violet Crystal*, is of a violet colour, bordering on purple. Plutarch says the amethyst takes its name from its colour, which, according to him, resembles wine mixed

with water. The *oriental* kind, which is the scarcest and most valuable, is of a dove colour, and extremely hard. The German is of a violet colour. There are beautiful ones found in the Pyrenees, and in the mountains of Auvergne. The amethyst is similar in its constituents to sapphire, except that it contains also manganese. The *occidental* amethyst consists merely of rock crystal coloured with iron. This stone is not very hard, and may be cut with a leaden wheel, smeared with emery moistened in water. It is polished on a pewter wheel with tripoli. It is easily engraven on, either in basso or alto relievo.

The BERYL is of a light or pale green colour passing into blue and yellow. The beryl of the ancients is the same with what in latter times has been denominated *aqua marina*, on account of its azure or sea-green colour. Some authors take the beryl to be the diamond of the ancients; this is certain—the ablest modern jewellers sometimes mistake the one for the other. There are two species of this stone, the oriental or precious beryl, and the occidental or schorlous beryl; the former contains cilica, alumina, glucine, lime, and oxide of iron; the latter, silica, alumina, lime, and water. The precious beryl is much harder than schorlous beryl. The beryl is sometimes found large enough to form fine vases. It is said that there are many of them in Cambaya, Pegu, and Ceylon. It occurs in considerable quantities in Saxony, Bohemia, and Moravia.

AGATE is a term applied to gems of different names and colours; agates are partly transparent, and partly opaque; usually diversified with a variety of colours, veins, spots, &c. sometimes exhibiting figures, or appearances of natural objects. The principal are these four, the *onyx*, the *common chalcedony*, the *black*, and the *German* agates. Agates have, ordinarily, reddish tints, and are of all colours, except bright red, orange, and green. There are compounds of chalcedony, carnelion, jasper, hornstone, quartz, amethyst, and opal. De Boot mentions one of the size of a nail, wherein a bishop in his mitre was very well represented; and turning it a little, a man and a woman's head were seen in its place. The Sardian and Sardonic agates are very valuable: the latter is of a sanguine colour, and is divided into zones, which seem to have been painted by art. Pliny, Strabo, and Cicero say, that Polycrates's ring was a sardonyx. No country affords finer agate or in greater abundance than Germany. It is found in great quantities at Oberstein, where several thousand persons are employed in quarrying, sorting, cutting, and polishing it. Agates are principally composed of quartz with various tinging materials.

CHALCEDONY is a genus of which there are various species; the *Mocha stone*, *Sardonyx*, *onyx*, *&c.* are species of chalcedony; as are also *common chalcedony* and the carnelion. The colour of common chalcedony is a nebulous milky gray, in all its shades. It is commonly semitransparent, harder than flint, and brittle. It is found in Ireland, the Ferro Isles, Saxony, Silesia, Siberia, Scotland, Cornwall, &c. It is susceptible of a fine polish, is employed as an article of jewelry; it consists of silica, alumina, and a very little iron. There are also a *blue*, a *black*, and a *yellow* chalcedony.

The ONYX is an agate of a dark horny colour, resembling, as its name imports, the nail of a man's finger, in which is a plate of bluish white, and sometimes of red; the several colours appearing as

distinct as if laid on by art. There are some brought from Arabia mixed with a brownish hue; which, after taking off one layer or zone, show another underneath of a different colour. White zones or girdles are essential to an onyx.

The JASPER is chiefly opake, but sometimes transparent. The most beautiful is that bordering on the colour of lake or purple; next to this the carnation; but what is now most valued is the sanguine jasper, being green spotted with red. That in which the red is paler is called *heliotrope*. Jasper consists of silica, alumina, magnesia, oxide of iron, and potash. The varieties of jasper, are, the *Egyptian*, the *striped*, the *porcelain*, the *common*, and the *agate;* they are hard, susceptible of a high polish, become harder on being exposed to fire, and occur of a red, green, yellow, brown, purple, gray, blackish, and variegated colour. In some jaspers nature seems to have amused herself in representing rivers, trees, animals, landscapes, &c., as if they were painted. Jasper is found in Egypt, Germany, Scotland, Shropshire, &c.

The OPAL, or *Noble opal*, is among the most beautiful productions of the mineral world; the finest specimens come exclusively from Hungary. In it are seen the red of the ruby, the purple of the amethyst, the green of the emerald, beside yellow, blue, and sometimes black and white. Its form is always either round or oval, like a pearl; its prevailing colour white. Its diversity of colours makes it almost of equal value with the sapphire or ruby. *Hydrophane* is a variety of opal which is white and opake till immersed in water; it then resembles the former. *Common opal* is of a dirty white, and does not exhibit the colours of the noble opal. Opal is found in Hungary, Cornwall, Scotland, Ireland, Mexico, and near the Carpathian Mountains. Pliny and Solinus mention a species of opal called *hexacontalithus*, which had sixty colours. There is an artificial opal, made so as nearly to represent the natural stone. The largest constituent of opal is silica, mixed occasionally with oxide of iron, alumina, and lime.

The CARNELION is a chalcedony, generally of a blood-red, or bordering on orange. In many of its characters it nearly resembles the common chalcedony. It is but little transparent, cuts easily: most of the fine gravings of antiquity, whether in relievo or intaglio, are on this stone. The finest carnelions are brought from near Babylon, Arabia, and Hindoostan; the next from Sardinia; the last from the Rhine, Bohemia, and Silesia. To give these stones a greater lustre, in setting them, a piece of silver leaf is laid underneath. The principal use made of carnelion is in seals, as it graves well, and takes a fine polish. It is also used for bracelets and other ornaments.

The HYACINTH, or JACINTH, is so called from its resemblance to the purple flower named hyacinth. This, however, agrees with the ancient, rather than the modern hyacinth, which is usually of a deep reddish yellow, approaching to a flame colour, or the deepest amber. Hyacinths are distinguished into oriental and occidental. The oriental comes from Ceylon, and is equal in hardness to the oriental amethyst. The occidental is found in Bohemia and Portugal, and is somewhat softer. This stone graves or cuts finely, and would be more used for seals, but that the graving frequently costs more than the stone. The ancients used it for amulets and talismans. The

hyacinth contains 70 per cent. of zirconia, 28 of silica, and a small portion of oxide of iron.

We may mention here that the earth ZIRCON is a white insipid substance, found in the *Zircon*, or *Jargon*, of Ceylon; a semi-transparent crystallized mineral, of a gray, yellowish, or reddish brown colour; it affords zirconia as well as the hyacinth.

The PEARL is a hard, bluish, white, spherical concretion of considerable lustre, found in different testaceous fishes both of the muscle and oyster kind; although an animal production, it is usually ranked among the number of gems. The fish in which pearls are chiefly found, is called, by naturalists, *mytilus margaritiferus* or pearl muscle, but popularly the pearl oyster. It is about eight inches long and nearly as broad; inhabits both the Indian and American Seas. The inside of the shell is beautifully polished, and produces, it is said, the true *mother of pearl.*

All pearls are formed of the same matter as the shell, and consist of a number of coats spread with regularity one over the other; they are exactly similar in composition to mother of pearl, and consist of 66 parts of carbonate of lime, and 24 of albumen. They have been supposed to originate from a disease in the creature which produces them: but every fish of this species is said to have incipient pearls in it; the hypothesis of disease is hardly, therefore, tenable. It is old oysters in which the best pearl are found. This fish arrives at maturity in seven years. The chief pearl fishery, as regards this country, is off Ceylon. But pearls are obtained in many other places of the Indian seas, in the Persian Gulf, on the American seas, on the coast of Scotland, and in a river in Bavaria. Each muscle commonly yields ten or twelve pearls, though a hundred and fifty, it is said, have been seen in the same fish.

The *Pearl Fishery*, on the pearl banks, near Ceylon, employs a considerable number of men and boats. The divers have stones attached to them, in order that they may descend quickly; to the diver is also attached a rope, which is connected with the boat above; when at the bottom he collects as fast as possible all the oysters he can find, and places them in a bag or net; having done this, on a signal, he is pulled up by the men in the boat; the most expert divers do not, it is said, continue more than from one minute to a minute and a half under water. It is a dangerous practice, and rendered much more so by the sharks, so common in those seas. The oysters are not immediately opened for the pearls, but they remain in heaps for ten days, when, becoming putrid, the pearls are more easily separated from them. They have afterwards holes drilled in them. Different modes of obtaining pearls are practised in other countries, but this is considered the best.

STONES.

STONE is a general term for certain natural, inorganic bodies, that are hard, brittle, and insoluble in water, or nearly so. Having spoken of Precious Stones, we have now to notice the more common kinds; as Marble, Porphyry, Alabaster, Portland Stone, &c.

MARBLE is a valuable stone, consisting of lime and carbonic acid, in the modern language of mineralogy carbonate of lime, &c.; found in great masses, and dug out of pits or quarries. It is hard, compact,

and so fine as readily to take a beautiful polish; it is much used in ornaments of buildings, as columns, statues, tombs, chimney pieces, &c. The varieties of marble are innumerable; some are of one simple colour, as white, or black; others streaked or variegated with stains, clouds, waves, veins, &c.; but all opaque, except the white, which, when cut into thin pieces, becomes semitransparent. *English white marble* is veined with red. *Derbyshire marble* is beautiful and variously clouded. That of *Devonshire* is either black with white veins, or red shaded with gray and orange. *Marble of Auvergne*, in France, is of a pale red, mingled with violet, green, and yellow. The most celebrated statuary marble, is that of *Paros* and of *Mons Pentelicus* near Athens; the marble of *Carrara* on the eastern coast of the Gulf of Genoa is much esteemed. In *Anglesea* is obtained a marble intermixed with green serpentine, little inferior to *Verd antique*.

Among inferior *lime-stones*, we may notice *bituminous lime-stone*, abundant near the Hot Wells, Bristol, and called *swine stone* or *stink stone* from its smell.

Artificial Marble is only marble pulverized, and mixed in a certain portion with plaster; the whole well sifted, worked up with water, and used like common plaster. With this stucco are made statues, busts, basso-relievos, and other ornaments of architecture. Marble is polished by being first rubbed with free-stone, afterwards with pumice-stone, and lastly with emery or putty (calcined tin).

PORPHYRY is considered as a primitive rock; its essential constituent is felspar. It is of a brownish red, green, or black colour, frequently interspersed with white stains; formerly brought from Egypt, and exceeding all other stones in hardness. The ancient porphyry quarries have been long since lost, and the art of cutting it, as practised by the Egyptians, is also lost. The modern tools will scarcely touch it. Either the ancients, therefore, had the art of tempering steel better than we have, or they had the art of softening the porphyry; though it is probable, that time and air have contributed to increase its hardness. The common aspect of porphyry is that of blocks or masses like some varieties of granite. Porphyry is an exceedingly durable material for architectural purposes. It is met with in many parts of Britain; on the banks of the Awe, at the base of Ben Cruachan, and amidst the precipices of Ben Nevis. The British porphyries are many of them very beautiful, and, for all ornamental purposes, will supply the expensive foreign varieties.

SERPENTINE is one of the primitive rocks; its appearance is singularly picturesque and beautiful; it has its name from the variety of tints which it exhibits, such as bright red, green, brown, yellow, and their various shades, and is often prettily traversed by veins of a substance called *steatite* or *soap stone:* it is often confounded with porphyry. There are two varieties of serpentine, the *common* and the *noble*. The first contains silica, magnesia, alumina, water, oxide of manganese, lime, and iron; and is found in various places in Europe. It is soft, takes a good polish, and is turned into vessels and ornaments of a great variety of shapes; the serpentine of Portsoy, when cut, is very beautiful and much esteemed. *Noble* serpentine is found in Silesia and Italy; it is soft and of a dark leek green; its constituents are chiefly silica and magnesia. The *verd antique* is a variety of this kind of serpentine.

JADE, a *nephritic stone*, or *axe stone*, a variety of soap stone, is found

in the Aps, China, India, America, and New Zealand. It is very hard, of a leek green colour; the natives of New Zealand use it for hatchets. *Soap stone*, or *steatite*, has different tints of gray and green; its name is given to it from its unctuous feel. It is found among the serpentine in Cornwall, and carefully collected for the porcelain works of Swansea, in which it forms an important ingredient. It consists of silica, magnesia, alumina, iron, a trace of potash, and water.

GRANITE, so called from its appearing to be composed of a number of distinct grains, is a primitive rock, and one of the most abundant in nature. It forms the most elevated parts of lofty chains of mountains. It is white or red, and is composed of quartz, felspar, and mica, of the latter in the least quantity. The stones used in paving the streets of London, and most of the curbstones, are of granite brought from Scotland. Granite is very hard, but not susceptible of a fine polish. It is found in all the quarters of the world; in England, Ireland, and Scotland; in England however chiefly in Cornwall, Devon, Westmoreland, and Cumberland; there is very little granite in Wales.

FLINT consists almost entirely of the earth termed *silica* or *silex*. It is commonly of a gray colour, varying from ash gray to grayish black and brownish red; it occurs generally in roundish masses of no great magnitude, rarely in crystals, and sometimes in hollow perforated globules. It is found in almost all countries, although not very abundantly in Scotland, and is used, when split into narrow thin pieces, as flints for gun-locks, or to strike fire with steel to light matches, and for the manufacture of glass instead of fine sand. Flint is also used largely after being burnt and pulverized, in the manufacture of porcelain, &c. The best flints are found in chalk. The Indians use two pieces of wood, which they rub violently against each other, instead of steel and flint, to generate fire or inflame a match.

MILL-STONES are chiefly composed of quartz and felspar, the latter in small particles, with a little mica; they are very hard, not susceptible of a polish, and by their numerous unequal angular prominences, are particularly adapted for grinding corn to powder. Millstones are principally brought from Normandy in France; their chemical and mineralogical characters have never yet been sufficiently examined. There is, however, much reason to believe, that, if the mountains of Scotland, Ireland, or Wales, were minutely investigated, a stone in every respect fit for mills would be found.

ALABASTER, or *compact gypsum*, is a well-known mineral, used by architects, statuaries, plasterers, and others. It is a sulphate of lime. Alabaster is found of various kinds and colours; snowy white, yellow, variegated, reddish, and in masses of various shapes and sizes. Most of the alabasters are interspersed with veins of different colours. Alabaster is found in many different parts of the world, and in abundance in several places in England, Derbyshire, Cumberland, Oxfordshire, and on the shores of the Bristol Channel. Alabaster is, in general, so soft, that it may be cut with a knife: yet it admits of a fair polish. Alabasters are frequently used by statuaries for small statues, va ses, columns, &c. The clearness and fineness of this stone renders it in some measure transparent, whence it has been occasionally employed for windows. There is a church in Florence still illuminated by alabaster windows; instead of panes of glass, there are slabs of alabaster nearly fifteen feet high, each of which

forms a window, through which the light is conveyed. A new manufacture of basso-relievos, from a singular species of factitious alabaster, was established several years ago by M. Letapie, at the baths of St. Philip, in Italy. The stream of these baths deposits a peculiar kind of sand, which, when collected and condensed in the cavities of any body employed to oppose its current, acquires the nature, hardness, and colour of alabaster, and assumes the forms of those cavities in which it is thus lodged.

Plaster of Paris is alabaster, or other gypsum, deprived of its water of crystallization; for this purpose pieces of alabaster are baked in an oven; or the alabaster is coarsely powdered, and boiled in an iron pot over a fire, when the water of crystallization is driven off. It is then in a state, on being mixed with water, for forming casts, cements, &c.

Gypsum, in powder, is sometimes strewed over land as a manure.

FLUOR SPAR, *Fluate of Lime*, or *Derbyshire Spar*, is found in many parts of the world, but in great beauty and abundance in Derbyshire, where it is called by the miners *Blue John.* It is usually found in cubic crystals, and generally occurs in veins in detached masses, from one inch to more than a foot in thickness. Its colours are extremely various. *Compact fluor* is a scarce variety; the finest comes from Hartz: a third variety is *chlorophane*, so called from the beautiful pale green light which it exhibits when heated. The variety found in Derbyshire affords beautiful vases, and other ornamental articles. Its specific gravity is 3.

The most singular product of fluor-spar is an acid, called the *fluoric* or *hydrofluoric acid*, which has the peculiar quality of dissolving glass, on which engravings by this acid have been made. It is colourless, of a very pungent smell, and extremely corrosive and destructive; at 80° it becomes gaseous; exposed to the air, it produces white fumes; passed through water, it converts that with which it comes in contact into a species of stone. On the first discovery of this acid, this property of converting water into stone excited much attention.

EMERY is a sub-species of rhomboidal corundum; it occurs massive, and also in granular concretions; its colour is between grayish black and bluish gray; when powdered it has a reddish hue. It is so very hard as to scratch topaz. Its constituents are alumina, silica, and iron. It is found in various parts of Europe, but is usually imported from the Island of Naxos, in the Archipelago; it is found also at Smyrna. It is used for polishing hard minerals and metals, both in powder and in various sized grains.

The FREESTONE, or *sandstone*, obtained from the peninsula of Portland, and thence called *Portland-stone*, is much used, being softer and whiter than Purbec-stone, and is commonly raised out of the quarries in larger blocks. *Bath-stone* is another free-stone which abounds in the neighbourhood of Bath, and with which almost all the houses in that city are built. Both these stones contain a considerable portion of sand united by lime. They are sometimes called *oolite.* Some also call *Rye-gate*, or *fire stone*, freestone. A competent knowledge of the stones used in building is of great importance; one stone dug out of a quarry being found to moulder away in a few winters, while another will brave the weather for many ages. Various other *Freestones* are dug up in many parts of England, of excellent use in build-

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ing. They are called freestones, from being easily cut. These stones occur in most countries, and are of a variety of colours; their chief constituent is sand, sometimes mixed with small particles of mica, or vestiges of shells. They are used for grindstones, scythe-stones, shoemakers' whetstones, &c.; and in buildings. Workmen constantly employed in cutting them generally die, it is said, of consumption. A kind of flexible gray sandstone is found in the Brazils. A coarse kind of sand stone is used for filtering water.

PUDDING STONE consists of fragments of stones of various colours, generally of a rounded form, conglutinated by earthy or other cements, which are usually talcose, calcareous, argillaceous, or silicious, the last the most frequent; it is found in various parts of the world; some is obtained in England, which receives a fine polish, and is very ornamental. Green pudding stone is found in Egypt.

SLATE, or *Clay Slate*, is a blue fossil, very soft when dug out of the quarry, and is easily cleft, cut, or sawed into thin, long squares, for the covering of houses, and other purposes. London is chiefly supplied with slate from Bangor and Kendal. Cornwall also furnishes very fine slate. Slate is composed of silica, alumina, oxide of iron, magnesia, and lime. The ancients were unacquainted with the use of slate, and covered their houses with shingle, as we read in Pliny. Beside the blue slate, there is a grayish slate, called also *Horsham stone*, obtained from a town in Sussex of that name. The blue slate is a very light, lasting, and beautiful covering. We may judge of its goodness by its sonorous quality; if it emit a clear sound, it is good; or by weighing it, then letting it lie six or eight hours under water, and wiping it very clean; if it weigh then more than it did before, it will not endure, without rotting the lath or timber. The clay-slate, which varies in colour from light blue to purple, is the most generally used. The blackish gray kind is used in schools for writing slates; the splinter kind is made into pencils, and several varieties are used as whetstones. Some kinds of hard slate, or shistus, have iron pyrites and mica interspersed in them; others are soft, and used for designing, as *black chalk*. *Grawaucke* belongs to the slate genus; it is of a fibrous texture; of different colours, pale bluish, gray, red, or whitish yellow; it abounds in various parts of England.

PUMICE-STONE is a kind of spongy fibrous stone, very porous and friable, found in the ashes of most volcanoes. Pumice-stone is of three kinds; the glassy, of a smoke gray colour, glimmering, pearly, and very brittle; the *common*, nearly white and glimmering; both these occur in beds in the Lipari islands. *Porphyritic pumice stone* is grayish white, and contains felspar, quartz, and mica; it is associated with obsidian, pitch stone, porphyry, &c. It occurs in Hungary. Its specific gravity is 1.661, while that of common pumice stone is only from .752 to .914; this last consists of about 77 of silica, of alumina 17, soda and potash 3, and traces of iron and manganese. Pumice makes a very considerable article of commerce, and is much used in the arts and manufactures, to glaze pottery, and polish and smooth several works. Marblers and parchment-makers use the largest and lightest—curriers the heaviest and flattest—pewterers the smallest.

HONE, or *Polishing slate*, is a fine sort of whetstone, in stripes of yellow and slate colour. According to some accounts it is holly-wood petrified, or changed into stone, by lying in the water a cer-

tain time; but this does not appear probable. This stone is said to be found only in Bohemia. Several kinds of petrified wood are used as whetstones, but they are generally too hard and coarse for fine edges.

Colours and Paints.*

Certain COLOURS are called *primary* colours, in consequence of the rays of light, when passing through a dense medium, and especially through a triangular glass prism, being separated into *seven* colours; namely, *red*, *orange*, *yellow*, *green*, *blue*, *indigo*, and *violet*. Colours are also, in *dyeing*, distinguished into *substantive* and *adjective*. The former communicate colour without the intervention of any other substance; the latter require the intervention of some body possessed of a joint attraction for the colouring material and stuff to be died; this has been called a basis or *mordant*. Indigo is a *substantive* colour; *quercitron* bark, an *adjective* colour. In the arts, many colours are made by admixture of simple colours; thus a mixture of blue and yellow makes a green, black and white a gray, blue and red a purple, &c.

Native CINNABAR, a sulphuret of quicksilver, is a red, heavy, and brilliant mineral, found chiefly in quicksilver mines; indeed it is from this substance, which might be denominated the ore of quicksilver, that the greater part of that metal is obtained. Cinnabar, in its native state, is very little used. *Factitious*, or *artificial cinnabar* is formed of a mixture of mercury and sulphur, sublimed, and thus reduced into a kind of stone: of course it is also a sulphuret of mercury. The best is of a high colour, full of fibres. Factitious cinnabar is used by farriers as a medicine for horses; it is also given occasionally to the human subject as an alterative, but its chief use is by painters as a colour, it being a very vivid red, but drying with some difficulty. This cinnabar is rendered more beautiful by grinding it with gum water, and a little saffron; these two drugs preventing its growing black. The factitious cinnabar is of a brighter colour than the native. This cinnabar, finely levigated, is the *vermilion* of commerce; it is imported from China and Holland.

VERMILION was in great esteem among the ancients, under the denomination of *minium*. There is a *natural* vermilion found in some silver mines, in the form of a ruddy sand, which is prepared and purified for use. Vermilion is of various shades of colour, some deep red, others pale. It is of considerable use among the painters in oil and miniature; and likewise among the ladies, as a paint to heighten the complexion. Among the ancients, the images of the gods were painted with vermilion on the feast days; and their generals on the days of triumph.

RED LEAD, or *minium*, is an oxide of lead, used by painters, potters, &c. This seems to be the real minium of the ancients, which was a preparation of lead, obtained by fire.

WHITE LEAD, or *Subcarbonate of Lead*, used by painters, is obtained by exposing for some time thin plates of lead to the vapour of vinegar, in a bath of fresh stable dung. The white incrustation

* *The reader will find a more copious account of the nature and preparation of the different paints, in Hodson's "Cabinet of Arts," than suits the purpose of this work.*

is scraped off, and the lead is again steeped and scraped, till the whole is quite consumed. Of this white lead it is that the paint used by the ladies, called *ceruse*, is made. White lead is very dangerous, both in the grinding and in the using, being a rank poison.

MASSICOT is a yellow oxide of lead, nearly equalling Dutch pink in yielding a bright yellow, and surpassing it in durability.

PATENT YELLOW is a compound of *oxide* and *chloride of lead*. It is made by melting litharge and common salt together in a strong heat. It is a brilliant colour.

CHROME YELLOW is also a valuable and useful colour. See CHROME, in the metals.

BLUE is one of the primary colours. In limning, miniature, &c. the painters use *ultramarine*, *blue ashes*, and *smalt*. In oil and miniature they use *indigo*, *blue bice*, *blue verditer*, *lapis armenus*, *smalt* and *Prussian blue*, also a counterfeit ultramarine. *Dyers' blue* is one of their simple or mother colours, used in the composition of others. It is given chiefly with woad and indigo.

PRUSSIAN BLUE, *Hydrocyanate of Iron*, or *Prussiate of Iron*, was discovered by *Diesbach*, a colour-maker of Berlin, in 1710, and hence called *Prussian blue.* It is an excellent basis for many shades of blue paint; mixed with the *yellows* it forms also a variety of greens.

WOAD, called also *glastum*, is the produce of the *isatis tinctoria*, an annual plant, the seed of which is sown in the spring. It has usually two or three crops of leaves, the first of which is best, and the rest in their order. When the leaves are ripe they are gathered, let lie some time, and then ground in mills into a kind of pulp, which is then laid in small heaps, and closely and smoothly pressed down. In this state it remains for a fortnight; the external part is then worked into the mass, and the whole formed into oval balls, which are exposed to the sun under shelter; when perfectly dry they are ready for sale or use. The ancient Britons used to dye their bodies with it, and some hold that it was from this plant, called glastum, that glass took its denomination; though others derive both glass and glastum from the British glass, which signifies a blue colour. A woad blue is a very deep blue, almost black; and is the base of so many sorts of colours, that the dyers have a scale, whereby they compose the different casts or degrees of woad from the brightest to the deepest.

INDIGO is a deep blue feculence brought from the East and West Indies. It is obtained from the leaves of the *Indigofera tinctoria*, a plant, which the Spaniards call *anil*, and we *nil*, *Indian wood* and *indigo.* When the plant has arrived at a certain height, and its leaves are in a good condition, they are cut down, thrown into a vat, and covered with water, where they remain till a considerable fermentation ensues, and the water acquires a violet colour. The water is then let off into another vessel, where it is agitated by a kind of churn till it becomes frothy all over the surface, and every part is intimately blended. The matter is then left to subside, after which the water is poured off. It is then put into bags to drain; after which it is cut into pieces and hardened in the sun. There are several kinds of indigo; the *Flora*, a South American product; the *East India* and *Carolina* indigo; all of which are subdivided into various names and qualities. Good indigo is known chiefly by its exhibiting, when cut by a knife or scratched with the nail, a reddish copper-like

appearance. Indigo is used among painters, who mix it with white to make a blue colour; without this mixture it would paint blackish. It is mixed with yellow to make a green colour. It is also used in dyeing, and may be considered as the best basis of all black, blue, and green colours. Indigo mixed with starch, forms the many varieties of *stone-blue* and *fig-blue*, used by laundresses for tinging linen of a bluish hue.

SMALT is Zaffree levigated and washed so as to be reduced to a fine powder; it is used under this name for giving a blue colour to glass. It is also employed along with starch to give linens a finer and clearer cast, and known by the name of powder-blue. See COBALT.

BLUE VERDITER is a bright blue. It works easily with water. It is somewhat inclining to a green, and is the blue which is most of all mixed with yellow berries. Blue verditer is said to be the precipitate obtained from nitrate of copper by lime, powdered with the addition of from five to ten parts of lime in 100.

Green Verditer, of various shades, may be obtained by a solution of sulphate of copper mixed with a solution of potash, lime, &c.: the precipitate must be afterwards dried.

ULTRAMARINE, a beautiful blue, used by painters, is prepared from *lapis lazuli*, a sort of precious stone, called also *azure stone*, brought from China and Persia. It is found in mines of gold, silver, and copper, as also in pits of marble, which last is that generally in use. It is composed of silica, carbonate of lime, alumina, sulphate of lime, and oxide of iron; of which last, ultramarine is believed to consist. The *Armenian stone* bears a near resemblance to lapis lazuli, but this is a blue, friable, copper ore.

Next to ultramarine, BLUE BICE (a preparation of *lapis armenus*) is the moxt excellent, and is often made to serve instead of it. It works much better than smalt.

GREEN is a primary colour.

VERDIGRIS, or *Subacetate of Copper*, is a bluish green substance, manufactured chiefly in the south of France. It is made by spreading the husks and stalks of grapes, after the juice is expressed from them, upon plates of copper in jars, where they are moistened, and the acetic acid, produced by the acetous fermentation, combines with the copper, and converts the surface into green rust: this scraped off is the verdigris of the shops, which is brought to this country in leather bags, in which it is a hard lump. To convert it into paint, it is powdered and ground in turpentine varnish, oil, &c. Verdigris furnishes the best basis for green paint with which we are acquainted. It is very poisonous, and therefore should be handled with great care; merely powdering it is attended with mischief. *Distilled verdigris* is in crystals attached to sticks; it is an acetate of copper, and is superior as a pigment for many purposes.

SAP-GREEN is made in this country from the juice of buck-thorn berries, with the addition of gum-arabic and alum. It is an elegant water-colour green.

A variety of *green water-colours* may also be made with a solution of sulphate of copper, lime, potash, whiting, &c.; chiefly useful for colouring rooms.

RED is one of the simple or primary colours.

MADDER is a red, bitter, astringent root of a perennial plant, the

rubia tinctorum, much used by dyers, to give a strong, rich red colour. It was formerly used medicinally, but is now considered of no importance. When taken internally, its colouring matter is carried into the circulation, and imparts to the urine and the blood a deep red colour, and even tinges the bones.

COCHINEAL, or *Coccus Cacti*, is a dried female insect, in the shape of oblong grains, of a whitish brown colour, used by dyers for imparting red colours to cloth. The genus *coccus*, to which the cochineal insect belongs, consists of numerous species, many of them very prolific and troublesome in hot and green-houses. The most important species is the *coccus cacti*, or *cochineal coccus*, a native of South America, the West Indies, and Carolina, where it is found generally on the leaves of the *cactus opuntia*, prickly pear, or common Indian fig; but in Mexico and other Spanish settlements, it is reared with great care, and there it is fed only on the *cactus coccinilifer*, or *cochineal Indian fig*, which is cultivated for the purpose, and on which the insect attains a greater size than in its wild state. The female, of which the cochineal consists, is wingless, and swells to such a size, compared with its first state, that the legs, &c. are so small as to be hardly discoverable; so that on casual inspection, it looks more like a seed than an animal. The male, a small fly with wings, is about the size of a flea; he is active, and of a red colour; and only found in the proportion of one to 150 or 200 females. As soon as the female has discharged all her eggs, she becomes a mere husk, and dies. Care is therefore taken to collect the insects in their fullest state. They are detached from the plants by a blunt knife, then put into bags and dipped in boiling water to kill them; after which they are dried in the sun. It is said that the Spanish Government was formerly more enriched by the cochineal trade than by its gold mines. Besides being used as a dye for cloth, cochineal is occasionally used in medicine, but chiefly as a dyeing drug; it also yields the fine colour used by painters, called *carmine*. When mixed with starch, it forms the *rouge*, well known to ladies.

Cochineal is obtained from the East Indies as well as the West, &c.; but the East India cochineal is of an inferior quality. It is collected *six* times a-year from the wild cactus, but only *three* from the cultivated.

CARMINE is a bright red, or crimson colour, bordering on purple, used by painters in miniature. It is rarely used in oil, on account of its price. It is obtained from the colouring matter of cochineal, combined with potash or alum. The secret of producing it is in very few hands. A decoction of Brazil wood, precipitated by nitric solution of tin, affords a tolerably good carmine. Shreds of scarlet cloth boiled in an alkaline lixivium, afford also carmine.

LAKE is a general term for a pigment, formed by precipitating colouring matter with some earth or oxide. Thus the carmine just described is properly a lake. Sir H. C. Englefield procured a fine red lake from madder. As there are several sorts of lake, distinguished by their colour, there are as many different ways of preparing them from various materials.

ROSE PINK, or *Rose Lake*, is prepared from chalk, and an extract of Brazil or Campeachy wood. It is the most common paint used by stage-players, and is useful to house-painters and paper-stainers, where it can be secured from the air by a varnish. It is a fine colour, but fades very quickly.

LAC is a resinous substance, secreted by the female of a very minute insect, the *coccus lacca*, found, it is said, on the branches of a tree called *bilhar*, in Assam, and elsewhere in India. The insect is nourished by the tree, fixing itself upon the twigs and extremities of the succulent branches, where it deposits its eggs, which it glues to the branch by a red liquid, the outside of which hardens by the air, and serves as a cell to the future insect, which, when arrived at maturity, eats through the coat, leaving a hollow, red, resinous bag, which is *stick lac*. The best lac is procured from the province of Assam, but it is obtained in great plenty on the uncultivated mountains on each side of the Ganges. There are three kinds of lac, viz. *stick lac*, which is lac in its natural state, found on the branch or stick, without any preparation; *seed lac*, which is stick lac broken into small lumps and granulated, and *shell lac*, which is a preparation of the stick lac. By a number of very accurate experiments made by Mr. Hatchett, it is found, that lac consists of a colouring extract, resin, gluten, and wax, all of them in intimate combination. Lac is employed for a variety of purposes in the arts; the finer specimens are cut into beads for necklaces. It enters largely into the composition of sealing wax, and hard japans or varnishes, and is much used in dyeing.

LAC DYE and LAC LAKE are two articles now regularly imported from the East Indies, in lumps of a dark reddish or blackish colour; they appear to be the colouring matter of seed lac, obtained from it by a process not generally known. They impart to cloth a beautiful scarlet, it is said, even superior to that obtained from cochineal.

KERMES, an insect of the *coccus* kind, found on an evergreen oak, *quercus coccifera*, once of considerable use both in physic and dyeing; but from the former it is now exploded, and in the latter it has been superseded by cochineal. Before cochineal was known in Europe, it was collected in considerable quantities in Poland, and thence exported to other countries.

YELLOW is one of the primary colours.

TURMERIC was formerly considered a medicinal root; it is now, however, used chiefly as a yellow dye; but it yields a fugacious colour. The plant is a native of both the Indies. The root is an ovate bulb, from an inch to an inch and a half in length, breaking with a dark resinous fracture. The colour of the root, when powdered, is a beautiful yellow. The alkalies and alkaline earths change it to a brick red, hence to the chemist it is an excellent test for the presence of these substances.

ZEDOARY appears to be a species of turmeric, and is similar in colour and properties.

SUMACH of commerce is the pulverized leaves and branches of a bushy tree, *rhus coriaria*, or elm-leaved sumach, which rises about ten feet high, a native of the south of Europe and Palestine, used for dyeing and tanning. Sumach is esteemed good when it is of a strong odour, of a lively green colour, free from stems and well ground. It is cultivated with great care by the Portuguese and Spaniards; its shoots are cut down every year close to the root, and after being dried and powdered in a mill, are ready for use. Sumach dyes various gray, drab, slate, and yellow colours. Turkey leather, it is said, is always tanned with sumach. The *rhus cotinus*, or Venice Sumach, is used by the Spaniards for dyeing and tanning their yellow leather, which is

both brilliant and durable: by the French dyers under the name of *fustet* and *redoul.* It is apprehended that a considerable quantity of the latter kind of sumach, or *fustet*, is sold in this country for

FUSTIC, which is a yellow wood brought from Cuba, Tobago, Brazil, and the West Indies. The real fustic tree is a species of mulberry, *morus tinctoria*, and grows to a considerable size; its wood ground to powder, and the

QUERCITRON BARK, which is obtained from a large American tree, the *quercus nigra*, or black oak, are now the principal substances which yield all the yellow dyes in our manufactories.

WELD, *Dyer's weed*, *Wild wood*, *Yellow weed*, or *reseda luteola*, is a biennial plant used by dyers to impart a yellow colour. It is much cultivated in Kent. With potash it yields a deep lemon colour: indeed it dyes all colours, between white and a deep yellow; and its dye will hold well. For the finest yellows, dyers first boil the cloth or stuff in alum or potash; and then give the colour with weld.

ANNOTTO, *annatto* or *arnatto*, is a red, earth-like substance, brought from the West Indies and South America. It is procured from the pulp of the seed-capsules of a shrub called *achiotte*, the *bixa orellana*, Linn., which grows seven or eight feet high, and produces pods, each containing thirty or forty seeds, enveloped in a pulp of a bright red colour. After the pulp and seeds are repeatedly pounded, boiled, strained, and dried, it is fit for sale. Annatto is brought to this country in round rolls, and in this state is called *Spanish* Annatto; or enveloped in flags in soft masses, hence called *flag* annatto: but most of the annatto sold for colouring cheese, and a considerable quantity is used for this purpose in this country, is in cakes, prepared here from the imported articles and other ingredients. Annatto is also used for imparting to wool, &c. adeep orange colour, and for colour called Nankin. It is useful as a colouring ingredient in varnishes and lackers. The liquid sold under the name of "Scot's Nankin dye" seems to be nothing but annatto dissolved in an alkaline ley.

SAFFRON, or *Crocus sativus*, a plant cultivated in Cambridgeshire and Essex, whence the drug called saffron, or crocus, is gathered. It has a bulbous root, long leaves, and a lilac flower, which unfolds in September. From the middle of the flower arise three long flame coloured filaments, and these are properly the saffron; the rest of the flower being of no use. Five pounds of fresh filaments make one pound of dry saffron. The best saffron in Europe is that of England; that brought from Spain is said to be injured by the oil, which is mixed with it to make it keep. *Saffron* is used both in food and medicine, but is of little use in either except as a colouring material. —It is also used by illuminators, to make a golden yellow colour.

GAMBOGE communicates to spirit of wine a bright golden colour, and entirely dissolves in it, and in water. It makes a beautiful yellow, and is much used by painters. Dr. Lewis says, that it leaves a beautiful and durable citron yellow stain upon marble, when rubbed in substance upon the hot stone. It is used in water-colours for *yellow* alone; or with blue to make *green.* With lime-water it yields a blood-red colour. See Part I. page 87.

LITMUS, *Archil*, *Archilla*, *Rocella*, *Orseille*, or *Turnsole*, names applied to a dye in the form of a red paste, prepared from a species of lichen, growing upon rocks in the Canary and Cape Verd Islands, and in the south of France. This weed is imported to us as it is ga-

thered; it is prepared for the use of the dyer, by grinding it between stones so as to thoroughly bruise, but not to reduce it into a powder, being moistened occasionally with a volatile alkaline solution, or urine itself mixed with quick lime; in a few days it acquires a purplish red, and at length a blue colour; in the first state it is called *archil*, in the latter *lacmus*, or *litmus*. Some say that potash and chalk are also employed in its preparation, the last merely to increase its weight. It is generally met with in commerce in the form of cakes like annatto.

It yields a rich purple tincture, fugitive, but extremely beautiful. The chief use the dyers make of it is for giving a bloom to other colours, as pinks, &c. Prepared archil readily gives out its colour to water, volatile spirits, and alcohol. It stains marble of a beautiful violet. There is an article under the name of CUDBEAR, manufactured from archil, in great repute for dyeing various shades, from *pink* and *crimson* to a *Mazarine blue;* and it is said these colours are very permanent. Litmus is used in chemistry as a test, either staining paper with it, or by infusing it in water, when it is usually, but improperly, called *Tincture of Turnsole;* turnsole being a different plant. See TURNSOLE, p. 150.

OCHRES are yellow and red earths, used by painters. They contain much oxide of iron.

SPANISH BROWN is also an oxide of iron. Among painters it is used as the first and priming colour. It works well if ground fine. In choosing good, that which is freest from stones, and of the deepest hue, is the most esteemed. For many purposes it requires to be burnt.

VENETIAN RED is a similar pigment to Spanish Brown, but of a more brilliant colour; it is used for common purposes in oil painting.

RUDDLE, red *hematites*, or *bloodstone*, is a sort of dusky red chalk, or earth, found chiefly in iron mines. It was called by the ancients, *hæmatites*. Pliny reckons five kinds. That commonly used by painters is factitious, being made of Armenian bole, and other drugs. The native or fossil kind comes from Egypt, Bohemia, &c. The gilders use it for burnishers to polish their gold with.

BLACK; something opaque and porous, that imbibes all the light falling thereon, reflects none, and therefore exhibits no colour. There are various kinds of blacks. The dyers when they are to dye cloths, &c. black, commonly first dye them blue, with woad or indigo, and the black is given afterwards with logwood, or galls, green coperas, and sumach. When the cloth is dyed black without being previously dyed blue, it is called Jesuits' black. This mode is said to have been invented by the Jesuits, and was practised in their houses.

IVORY BLACK may be made of ivory shavings or small pieces of ivory burnt between two crucibles well luted; which, being thus rendered perfectly black, is sometimes ground in water, and made into small cakes; but most of the ivory black of commerce is obtained from bones, as mentioned under ammonia, in PART I.; it is a black powder. It consists of charcoal and earthy matters. There is a *German*, or *Frankfort black*, made by grinding burnt peach-stones and burnt wine-lees with ivory black.

LAMP-BLACK, which is nearly all charcoal, is obtained in the large way by burning terebinthine matter where the smoke can be conden-

sed and collected like soot. It is prepared at turpentine works in this country ; it is also obtained from the decomposition of oil in lamps, whence its name. This black mixed with lintseed oil, as it is for painting, sometimes takes fire spontaneously. See page 77.

SPANISH BLACK is so called, because first invented by the Spaniards, and most of it brought from Spain. It is no other than *burnt cork*, of course a charcoal, and used in various works, particularly among painters.

There are several colours that require burning, such is LAMP-BLACK, which is of so greasy a nature, that except it be burnt, it will require a long time to dry. The method of burning lamp-black, is as follows : —Put it into a crucible, over a clear fire, letting it remain till it is red hot, or at least till no smoke arises from it.

UMBER, if intended to be a shadow for gold, &c., and on some other occasions, is best burnt ; you may put it into the naked fire in large lumps, and not take it out till it is thoroughly red hot ; or, if you wish to be more curious, break it into small pieces, put it into a crucible, and make it red hot. There are different substances sold under the name of umber : one is a kind of ochre, consisting of oxide of iron, oxide of manganese, silica, and alumina ; this is called *Turkey umber*, it is of a dull brown, and brought from the Island of Cyprus ; another, *English umber*, is of inferior quality ; and another consists principally of particles of decayed wood mixed with bitumen.

BISTRE is prepared from wood soot, that from beech is the best, by boiling it in water, then pouring off the clear liquor and evaporating it to dryness ; a deep brown colour is the result, which, when mixed with water, is transparent. It is used by painters to wash their designs. Bistre dissolved in an alkaline solution by boiling will make an *indelible ink;* but it is *brown*, not *black*.

INDIAN INK, or *Chinese ink*, is brought from China in small black pieces or figures ; but the most usual is the rectangular, about a quarter of an inch thick. Some of the sticks are gilt, with figures of dragons, birds, flowers, &c. Of the composition of this ink nothing is with certainty known, although many forms for making it have been made public. In fact we only know that it should be black, smooth, and glossy when broken, and that it is a useful and valuable water-colour paint. From analysis, however, it is said to be simply lamp-black made into a cake with isinglass, and scented with perfumes. Dr. URE indeed states, that fine soot from the flame of a lamp or candle received by holding a plate over it, mixed with clean size from shreds of parchment or glove-leather not dyed, will make an Indian ink equal to that imported.

DRYING OIL, or *boiled oil*, is usually made by boiling about four ounces of litharge in a gallon of lintseed oil till it is dissolved ; it is, however, a dangerous process, and requires care not to make the oil too hot, or it may explode. A more elegant drying oil may be made with the oil of white poppy-seeds, thus :—Grind one ounce of litharge very fine, then mix it with a pint of the oil ; shake the vessel which contains it very often ; in a month it will be clear and thin. This is used by our first painters.

Curious Woods.

Some woods, such as ebony, box, mahogony, calambac, cedar, &c. are valued on account of their extraordinary hardness, beautiful polish, brilliant colours, or agreeable smell, and are made into cabinets, tables, combs, beads, &c.

EBONY is a valuable wood, the produce of the *Amerimnum ebenus*, a native of the East and West-Indies, of which there are several varieties that yield woods of different colours, chiefly, however, *black*, *red*, and *green*; the first, in most estimation, is exceedingly hard, black, and heavy, its specific gravity being 1.3, or more; it is capable of a very fine polish, and on this account is used for toys, inlaid and *Mosaic work*. This last, we here take an opportunity of observing, was an assemblage of marble shells, stones, glass, &c. and sometimes of wood, ivory, and ebony, of various colours, cut into squares and other shapes, and cemented or inlaid by the ancients, with which they adorned their floors and richest furniture. The tree producing the black ebony is large and lofty, the bark is dark-coloured, and it has green myrtiform leaves. The best ebony is a jet black, free from veins and bark, very heavy, and of a sharp pungent taste. Ebony yields an agreeable perfume when laid on hot coals; and even when green, it readily takes fire. Since the discovery of staining wood, ebony has been less employed than formerly. *Green ebony* is produced by a tree less lofty, and more bushy, than that which yields the black: it grows in Madagascar, the Mauritius, the West Indies, and especially in Tobago: this is used in dyeing, and yields a fine green tincture. Of *red ebony* we know but little. Cabinet-makers, inlayers, &c. make pear-tree and other woods pass for ebony, by washing it with a hot decoction of galls, &c.

BOX is an extremely hard, smooth, durable, and fine grained wood, and therefore well adapted to the use of the turner. Button-moulds, knife-handles, combs, mathematical instruments, &c. are made of it, and may be very properly used as a substitute for ebony. Box is also used for *wood engravings*, and is usually imported in masses from Turkey for such purpose. It is of greater specific gravity than any other of European growth, being 1.328. Box was formerly an article in the Materia Medica, but is now expunged. English box is a very fine and hard wood, but not equal to what is imported.

LOGWOOD, *Campeachy*, or *Indian Wood*, is the product of a tree, the *Hæmatoxylon*, growing plentifully at Honduras, in Jamaica, &c. It is very heavy, and in burning gives a clear lasting flame. The logs externally appear dark red, when cut into chips it is reddish yellow. Logwood is principally used in dyeing, particularly black and violet. It has a sweet astringent taste, and is administered as medicine, in cases of diarrhœa and dysentery. It is said to be much used in Portugal to impart taste and colour to port wine; a decoction of logwood with a little Brazil rum, and extract of rhatany root, being, it is to be feared, sometimes sent to this country as genuine wine.

BRAZIL WOOD, or *Brasiletto*, is obtained from the *cæsalpina brasiliensis*, an American tree. The wood is of a red colour, very heavy, and denominated variously according to the places from which it is brought: thus we have Brazil of Fernambucca, Japan, and Lamon.

Fernambucca is esteemed the best. This tree commonly grows in dry barren places, and in the middle of rocks; it is very thick and large, usually knotty and crooked; its flowers, which are of a beautiful red, exhale a very agreeable smell, which is said to strengthen the brain. It grows naturally in the warmest parts of America, whence it is imported for the dyers, who make considerable use of it. The demand has however, it is said, been so great, that none of the large trees are left in any of the British plantations. The colour produced from this wood is greatly improved by a solution of tin in *aqua regia.* Brazil wood is much used in turned works, and takes a good polish; but it is chiefly valuable for the beautiful orange and red colours which it imparts to cloth. Its colours are fugitive; yet a good and permanent Turkey red can be dyed with it and verdigris; the latter being a mordant. SAPPAN is another species of Brazil wood, used for the like purposes, and found in the East Indies.

The CEDAR of LEBANON, or *Pinus cedrus*, is a native of Syria, chiefly about Mount Libanus; nor has it been found any where else as an indigenous plant. It is of great beauty, and bears the openest exposure so well, that it is surprising it is not more cultivated in England. Cedars thrive best in a poor soil, and are of quick growth, as it appears by those fine ones in the physic gardens at Chelsea, which were planted in 1683, and not then above three feet high, and in 1762 measured nearly twelve feet in the girth, at two feet above ground. Cedar wood is reputed almost incorruptible, a prerogative it owes chiefly to its bitter taste, which the worms cannot endure. The ancients for this reason made use of cedar tables to write on. Solomon's temple and palace were both of this wood. Historians tell us, that some of this timber was found in the temple of Apollo, at Utica, 2,000 years old. The cedar is included by Linnæus in the genus *pinus*, or firs. The red cedar of Virginia, and the bastard cedar of Bermudas, are different species of juniper. There is also a Jamaica bastard cedar, the only tree known of the genus *bubroma.* The spurious cedar is a soft wood, of a fragrant smell, but little used in this country except for making pencils. Cortez is said to have erected a palace at Mexico, in which were 7,000 beams of cedar, most of them 120 feet long, and twelve feet in circumference.

MAHOGANY is a wood well known in England. This tree is a native of the warmest parts of America, growing plentifully in the islands of Cuba, Jamaica, and Hispaniola, and also in the Bahama islands, and at Honduras. The excellence of its wood for all domestic uses is generally known. It abounded formerly in the low lands of Jamaica, but it is now found only on hills, and places difficult of access. This tree grows tall and straight, rising often sixty feet before it divides into limbs, and is sometimes four feet in diameter. The foliage is a beautiful, deep green; the appearance made by the whole tree very elegant. Some trees have reached a hundred feet in height. In felling these trees, the most beautiful part is commonly left behind. The part below, extending to the root, is not only of larger diameter, but of a closer texture than the other parts, most elegantly diversified with shades or clouds, or dotted, like ermine, with spots: it takes the highest polish, with a singular lustre. This part is only to be come at by digging below the earth to the depth of two or three feet, and cutting it through; which is so laborious an operation, that few attempt it. The Jamaica wood, for beauty of colouring, firmness,

and durability, is most valued. An inferior kind is brought from Honduras. The bark of mahogany has been occasionally used in medicine, instead of Peruvian bark.

SANDAL, or *Sanders wood.* Of this hard odoriferous wood there are several kinds ; the *pterocarpus draco*, which is a West Indian tree, thirty feet high, with a solid *white* wood, and the bark, when cut traversely, yields a blood-red resin, which is said to be the dragon's blood of the shops, but this is a mistake ; the *P. marsupium* is a native of Coromandel, and has an orange coloured wood ; and the *P. santalinus*, or RED SANDERS tree of India, with a deep red, a heavy, and very hard wood, used for fans and cabinet work. The white and yellow species are more fragrant than the red ; the latter is much used for colouring drugs, spirit for thermometers, porter, &c. The YELLOW SANDERS, or *santalum album*, an Indian tree, produces both *yellow* and *white* wood ; the former, being the central part of the tree, is the most fragrant, hard, and bright coloured ; the latter is soft next the bark, and possesses little fragrancy. The yellow wood is that which is most used ; the older and larger the tree, the more fragrant and valuable the wood.

The YEW tree furnishes a reddish wood, full of veins, flexible, very hard, smooth, and almost incorruptible. It is proper for turners and cabinet makers. The Yew tree does not grow to a great height, but its trunk often attains an immense circumference, it living many centuries.

GUAIACUM, or *Lignum vitæ*, is the wood of the *Guaiacum officinale*, a tree vulgarly known by the appellation of lignum vitæ, and yields the guaiacum of the shops. It grows in most of the islands of the West Indies, where it becomes a very large tree. The wood is solid and ponderous, and so hard as to break the tools in felling the trees ; its specific gravity is 1.333. It is seldom cut down for fire wood, being difficult to burn : but is of great use to sugar planters, for making wheels and cogs for sugar mills. It is also brought to Europe, and wrought into bowls, sheaves of ship-blocks, and other utensils. See PART I.

ALOES WOOD, *Calambac*, or *Calambour*, a kind of wood brought from the East Indies and China, usually sold under the denomination of *lignum aloes*. Various and contradictory accounts of this substance have been given ; it is said there are three kinds of this wood ; the *calambac*, or finest aloe-wood, is light, spongy, very fragrant, and varying from black to yellow, and often of a variegated colour. The *common* lignum aloes is more dense, and of a brown colour ; and the *calambour* is lighter, more bitter, of a green, black, or brown colour, and used by cabinet-makers and inlayers. Others say, that the aromatic wood of aloe is properly a resin, with which the affluent in the East perfume their houses ; hence it is rarely brought to Europe. Its odour is said to be very grateful. The truth seems to be, that very little correct information concerning aloes wood can be obtained.

ROSE-WOOD is obtained from the *amyris balsamifera*, an elegant and odoriferous tree found in Jamaica ; it is beautifully veined, and in much esteem by cabinet-makers for tables, chairs, and other articles of furniture.

LANCE-WOOD is imported from tropical climates in long poles, and is supposed to be the produce of a species of palm tree. It is one of the hardest, most lasting, and elastic woods known ; its colour is

yellowish white; its chief use is for the shafts of carriages, where elasticity, strength, and moderate lightness are desired to be combined.

Curious Trees, and other Vegetable Productions.

The BREAD FRUIT TREE, or *artocarpus incisa*, is certainly one of the most curious productions of the vegetable world; but as it is described in page 41, there can be no necessity for describing it again here.

SILK-COTTON TREE, or *Bombax*, comprehends a genus consisting of many species, all noted for producing a woody five-celled capsule, in which are the seeds involved in a fine *cotton* or *silk*, hence the name of this genus of trees, some of which are of the largest kind; one, the *Bombax pentandria*, an Indian tree, can, it is said, shade an army of twenty thousand men with its enormous branches; but the most important of the tribe is the *B. Heptaphyllum*, a native of South America, which affords a beautiful, fine, soft, purple down, and is spun without dyeing, and woven into dresses for the more opulent and delicate ranks of the natives. This raw material does not appear to have obtained the attention in this country which it assuredly deserves.

The MULBERRY, or *Morus*, is a name given to a genus of trees, consisting of many species, two of which are distinguished as furnishing food for that extraordinary and curious animal the Silk-worm. The *black*, or common mulberry, is a native of Italy, and is common in many gardens of this country; the *white* mulberry is a native of China. This last is commonly planted in the south of Europe as food for the silk worm; but the Persians use the common black mulberry, conjointly with the white, for this purpose. The black mulberry may be propagated by sowing the seeds, or by laying down the tender branches, or by cuttings; the plants from seeds are however the best; but there is in these a hazard of their being fruitful: for it often happens that such plants are males, and consequently sterile. Mulberries are by many considered an agreeable fruit.

The SILK-WORM, or *Phalæna mori*, is a most extraordinary insect; it is originally a native of China, where it is found on the leaves of the mulberry, its only natural and proper food. The caterpillar of this species, when full grown, incloses itself in a loose web, in the midst of which it forms a closer case of an oval shape, and varying in colour from white to a deep orange, but more commonly of a bright yellow. In this case, or *cocoon*, the animal becomes a chrysalis, and remains inclosed about fifteen days, when, having resumed an active life in the form of a moth, it makes a hole at one end of its prison, and comes out. This, as it destroys the value of the silk of the cocoon, is prevented in those countries, where the worm is reared as an article of trade, by killing the chrysalis by means of heat. The average length of the thread of a cocoon is about 500, sometimes 1200 ells. Many attempts have been made to produce silk in this country, but as an article of commerce, they have been unsuccessful. It is true, worms may be reared with the greastest ease; but, from experiments which we have made, we believe that the worm will be found to degenerate here—the mulberry not coming into leaf soon enough to supply the worms with their first

food: lettuce leaves have supplied their place, but very inadequately. See SILK.

SAGO is the fecula, or starch, of the *cycas circualis*, a tree growing in the East Indies. When it is felled, the natives cleave it in two, and dig out the pith, which is even then eatable, as it comes fresh out of the tree. This fecula is extracted from the pith of the stem and branches; and, it is said, also from the kernels of the fruit by trituration, and afterwards by maceration in water: it is then washed, passed through a perforated copper plate, so as to reduce it to grains, which are then dried, and are of a reddish colour. The flour thus prepared is called sago. Sago is also obtained from some species of the *areca*, or cabbage-tree palm. Sago makes a nutritious jelly, for persons with feeble digestive powers. It is said that the Japanese, who make great use of sago during war, are so fond of it, that it is prohibited under pain of death to give any of it to strangers. From the same tree a liquor is extracted, as agreeable to drink as our wines. The leaves, when young, are covered with a kind of cotton, of which cloth is made; and as they grow older, they serve to cover the houses of the inhabitants instead of tiles. The largest of these leaves also serve for stakes in building; and the smaller yield a kind of hemp, fit for making very good ropes.

SALEP, or SALOP, is merely the root of the *Orchis morio*, or female orchis, freed from its exterior covering, then exposed to the heat of an oven for a few minutes, and subsequently dried and powdered. The root is brought from Turkey, where it forms a considerable part of the diet of the inhabitants.

ARROW ROOT, or *Indian Arrow Root*, is a white starch-like powder, obtained from the root of the *Maranta arundinacea*, a native of the West Indies.

TAPIOCA is a white granulated substance, obtained from the root of the *Jatropha manihot*, or CASSAVA, a native American plant, every part of which, when raw, is a fatal poison; but its poisonous qualities are destroyed by heat. *Tapioca, Arrow root, Salep,* and *Sago* appear to consist chiefly, if not entirely, of starch, and they form useful and convenient varieties of food, when boiled, for the sick, and those whose digestive powers are not good. Besides these, many other plants yield a fecula, which may be similarly employed.

INDIAN RUBBER, *Caoutchouc*, or *Elastic Gum*, is the inspissated juice of many different plants growing in tropical regions both of the old and new world, but chiefly that obtained from the *Siphonia elastica*, or Elastic Gum Tree, found between the tropics in America, and as far as 40 degrees in the south latitude of that continent. This tree, in Brazil, grows to the height of fifty or sixty feet; is generally straight and without branches, except at the top; the leaves are green above and white beneath. Indian rubber is a singular and very useful article: no substance known is at once so pliable and elastic. The Indians make boots of it, which water cannot penetrate, and which, when smoked, have the appearance of real leather. Bottles are also made of it, the necks of which are fastened to hollow reeds, so that the liquor contained in them may be forced through the reeds or pipes, by pressure. One of these filled with water is always presented to the guests at their entertainments, who never fail to make use of it before eating. Flambeaux, an inch and a half in diameter, and two feet long, are likewise made of this gum, which give a beautiful light,

have no bad smell, and burn twelve hours. A kind of cloth is also prepared from it, which the inhabitants of Quito apply to the same purposes as our oil-cloth and sail-cloth. It is formed, by means of moulds, into a variety of figures for use and ornament; the *bottles* brought to this country are thus made:—Several deep gashes are made in the tree through the bark, whence the juice runs, and is received in shells; a ball of clay is fixed on the extremity of a stick, and repeatedly dipped into the extracted fluid. Each coating requires a short time to dry and harden, by exposure to the sun and air: several such coatings produce the thickness required. While yet soft, it receives any impression on the outside, which remains ever after. The thick blocks are made in moulds. Indian rubber, in its natural qualities, is closely allied to gluten, and very similar to the *bird-lime* of this country; it is insoluble in water and alcohol, but soluble in sulphuric and nitric ether and oil of turpentine: when heated it softens, and in that state is soluble in some of the fixed oils: it is said to dissolve easily in cajuput oil. Oil of turpentine is, however, used with heat as its common solvent; this solution is used for coating air-balloons. Indian-rubber is well known for taking out the stains of black-lead from writing-paper; it is also used in many operations of surgery, as instruments, where elasticity, softness, and durability are combined. Some of the large bottles are now fitted up, and make excellent vehicles for clysters.

For *mineral caoutchouc*, see BITUMENS.

The PAPER MULBERRY, or *Morus papyrifera*, is a native of Japan, where the bark is used for paper, whence its name, and also of Otaheite and the South Sea Islands, where it is manufactured into cloth, chiefly by women. For this purpose the bark is stripped from the stalks, and softened some time in water; it is then beaten with a square, grooved, wooden instrument, and then spread out to dry, the piece being from four to six or seven feet in length, and about half as broad; the pieces are united together by the glutinous juice of a berry called *tovo;* after being thus lengthened, they are placed over a large piece of wood, with a sort of stamp, composed of a fibrous substance, laid beneath them. A bit of cloth, dipped in the juice of the bark of a tree called Kobba, is rubbed briskly over the piece that is making, which leaves a dry gloss, and a dull brown colour upon the surface: the stamp at the same time making a slight impression, which finishes the work. This manufacture though so extremely inferior to many among the polished nations of Europe and Asia, seems, however, to mark some little advancement into civilized life.

The CORK-TREE is a species of the oak, or *Quercus suber*. The cork used by us is the *bark*. The fruit of the cork-tree is a real acorn, which is much more agreeable than that of the oak. It is found in great abundance in Spain, Italy, France, &c. To take off the bark, an incision is made from the top to the bottom of the tree, and at each extremity around it. When stripped from the tree, (which is not injured by the process,) the bark is piled up in a pond or ditch, and laden with heavy stones to flatten it, and reduce it into tables; hence it is taken to be dried; and when sufficiently dry, it is slightly charred or burnt, and packed up in bales for carriage. If care be not taken to strip the bark, it splits and peels off of itself; being pushed up by another bark from underneath. The chief use of cork is to stop bottles, &c.,

and sometimes to put in shoes and slippers: the Spaniards burn it to make *Spanish black*.

The TALLOW TREE, a name given to several trees of different genera, whose expressed oil is similar to tallow. The *Croton sebiferum* and the *Tomex sebifera* are however the chief; they are both natives of China, the first grows there in great abundance. It is about the height of a cherry tree, has deep red, shining, heart-shaped leaves, and very smooth bark. Its fruit is enclosed in a pod like a chestnut, and consists of three round white grains, of the size and form of a small nut; within each is a little stone encompassed with a *white pulp*, which has all the properties of true tallow, both as to consistence, colour, and even smell; and, accordingly, the Chinese make their candles of it, which would doubtless be as good as those in Europe, if they knew how to purify their vegetable, as well as we do our animal tallow. It is true, the candles they make yield a thicker smoke, and a dimmer light than ours; but these defects are owing, in a great measure, to the wicks, which are not of cotton, but only a little rod or switch, of dry, light wood, covered with the pith of a rush wound round it. We may just mention, that a green substance, similar in consistence to very hard mutton suet, and called *myrtle wax*, is occasionally brought to this country from America; it is the product of the berries of the *myrtus cerifera*, or American candle-berry myrtle. Candles made with it burn a long time, and emit a fragrant smell.

LIQUORICE-ROOT is the produce of the *Glycyrrhiza glabra*, or common liquorice, a shrub, native of the south of Europe and Syria, but cultivated in England, particularly in Yorkshire and around London. The root is perennial, but the stalks, which rise about four or five feet high, are annual. The leaves are pinnate, of a pale green colour; the flowers of a blue or purplish hue: the seeds do not ripen in this country; it is therefore propagated here by fibres, which issue from the parent root near the surface: the whole root will, however, bear transplantation very well. It is usually from two to three feet long; when fresh and good, it is about the thickness of the middle finger, or larger, of a dirty colour on the outside, yellowish within, and of a sweetish taste. Liquorice requires a light soil, and is planted in trenches about three feet deep, in rows a foot distant. An *extract* from the root is ordered by the London College, but it is rarely, if ever, prepared in this country; the common *Spanish Liquorice* of the shops supplying its place: and this, we are informed, is prepared from a farrago of herbs. It is brought from Spain and Italy. That which is black, shining, brittle, which readily dissolves in the mouth, and is of a pleasant taste, is esteemed the best. Liquorice, as a medicine in any shape, is now in very little estimation, its former credit being nearly gone. It is used, we believe, by the brewers, as well as Spanish liquorice, in considerable quantities.

SUGAR MAPLE tree, or the *Acer saccharinum*, grows in great quantities in the western countries of all the middle states of the American Union: but there only on the richest soils, and frequently in stony ground, rising generally to the height of forty feet, and is from two to three feet in diameter. It puts forth a beautiful white blossom in the spring, before a single leaf appears. The wood is extremely inflammable. It is supposed to arrive at its full growth in twenty years, and is not injured by tapping; on the contrary, it is said that the oftener it is tapped, the more syrup it yields. The usual method

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of extracting the juice is by boring a hole in the tree with an auger, into which a spout is put. The sap flows for a month or six weeks, according to the temperature of the weather. Troughs are placed under the spout to receive the sap, which is carried every day to a large receiver, and after being strained, the sugar is obtained from it either by evaporation, freezing, or boiling, of which the latter is the most expeditious mode. Besides the sugar, this tree affords a most agreeable molasses, and an excellent vinegar. The sap, which is suitable for these purposes, is obtained after the juice, which affords the sugar, has ceased to flow ; so that the manufacture of these different products of the maple tree, by succeeding, do not interfere with each other. The molasses may be used to compose the basis of a pleasant summer beverage. The sap is also capable of affording a spirit. A tree so various in its uses may one day, if duly cultivated, so supply us with sugar, as to silence the arguments of the planters in favour of a traffic (the slave trade,) which is now, by us, happily abolished.

FOSSIL, or *Subterraneous Wood*, is found in many places under ground ; whether it has been buried there from the time of the Deluge, or by some subsequent event, as many suppose, is not quite clear. In England there have been found, above a hundred feet under ground, several huge oaks, with all their branches on, and which by their situation had contracted a black colour, nothing inferior to jet, joined with a hardness, which far surpassed any living oak. Such trees could not have come there, unless by some general inundation, or subversion of the present habitable soil. Mr. Boyle mentions a huge oak dug out of a salt mine in Transylvania, so hard as not easily to be wrought upon by iron tools : yet being exposed to the air out of the mine, it became so rotten, that in four days it crumbled between the fingers. And Mr. Denham observes the same of the trees turned up by the breaches at Dagenham. In some countries such fossil wood is found petrified into stone ; in others it is so sound, as to be used in buildings, or made into very durable furniture.

TABASHEER is a white solid substance, found in the cavities of the bamboo, and other canes growing in the East Indies and South America : it consists chiefly, if not entirely, of silica. It is supposed to be first a liquid, and that it acquires, by degrees, the hard state in which it is found. Its optical properties are, according to Dr. Brewster, of a very singular kind.

The CABBAGE TREE PALM, the *Areca oleracea*, must not, in an account of curious trees, be wholly passed over. It is a native of the West Indies, and grows to the height of 170 or even 200 feet. The leaves, for it has no branches like most other trees, are sometimes twenty feet long. The interior of the leaf is used like hemp and flax for cordage ; the fruit, lying towards the top of the trunk, under the leaves, is in thin snowy flakes, sweeter than the almond ; the pith produces a kind of sago, and the nuts, called areca nuts, yield oil by decoction. In short, every part of this tree is useful ; it is esteemed one of the most beautiful of trees.

The BEN-NUT is a whitish nut, about the size of a small filbert, of a roundish triangular shape, including a kernel of the same figure, covered with a white skin. It is the fruit of the *Guilandina Moringa*, or *Morunga Nickar*, a native of Ceylon and the Malabar coast. This nut yields, by expression, a fine oil, called *oil of ben* or *benen*. It is

prepared in the Levant, Egypt, Syria, and Italy. On account of its remaining free from rancidity, it is used in perfumery as a vehicle for receiving the fragrant scents of various flowers. In Italy, this oil is used for cerates and liniments in pharmacy.

We may just mention here the BRAZIL NUT, now very commonly imported, and forming an agreeable variety among other nuts. Each nut is about an inch and a half, or more, in length, and about three quaters of an inch in its widest part; it appears to be the segment of a globe, so that the whole fruit consists, most probably, of six or more of such nuts. The kernel is white, and similar in taste to that of the cocoa nut, but more oleous. Of the tree which produces them we have not been able to obtain any account; but we conjecture it is of the palm kind. An excellent oil might, doubtless, be obtained from them.

TURNSOLE, a name applied to a plant or plants, because the flowers incline to the sun wherever it should happen to be in the heavens; many plants, however, evince a disposition of this kind. What plant is the real turnsole does not appear accurately known; some call the *Croton tinctorium*, turnsole, or lacmus plant, a native of the south of Europe, said to produce a juice surrounding its seeds, which is the real *litmus;* others say that the *Heliotropium tricoccum* is the turnsole: but that the *litmus* or *turnsole* of commerce is obtained from a lichen; and that the real origin of litmus was concealed by the makers of it more effectually by assigning it to the turnsole. Cupidity is a great enemy to truth. See Litmus, page 140.

In concluding our account of curious vegetable productions, we may mention a plant called the *Wild Pine*, which grows upon the branches of trees, and also on the bark of the trunk, in the West Indies, and other hot countries of South America. It has hollow or bag-like leaves, so formed as to make little reservoirs of water, the rain falling into them through channels which close at the top when full, and prevent it from evaporating. It holds in one leaf from a pint to a quart of water, which is often used for quenching thirst.

Another plant, the *Tillandsia*, called the *Water-with* in Jamacia, is of similar use; it is like a vine in size and shape, and although growing in parched districts, is so full of clear sap, that by cutting a piece two or three yards long, and merely holding it to the mouth, a plentiful draught is obtained. In the East is a similar plant, called the *Bejuco*, or *Cissus latifolia*, which grows near other trees, and twines round them, with its end hanging downwards, but so full of juice, that on cutting it a good stream of water spouts out.

Another plant, the *Nepenthes distillatoria*, found also in the East Indies, has a yet more singular structure. It has natural mugs or tankards hanging from its leaves, and holding each from a pint to a quart of very pure water. Over the mouth of the tankard grows a leaf, nearly its size and shape like a cover, which prevents evaporation; the water in the tankard is perfectly sweet and clear, although the

ground on which the plant grows is a marsh of the most muddy and unwholesome kind.

[A represents the *Nepenthes distillatoria*, with its pitchers of green and purple stripes. The lids A A move on hinges. They open in moist weather, and shut in dry, to prevent evaporation. When the pitcher becomes full, and requires additional support, the hook behind the lid seizes on some of the neighbouring tendrils, and holds by it. B B are young pitchers just unfolding.]

The *Cow-tree* grows in South America, in the most dry and rocky soils, and in a climate where for months not a drop of rain falls. On piercing the trunk, a sweet and nourishing milk is obtained, which the natives gladly receive in large bowls.

Of Timber Trees, and some of their Products.

Of *Timber Trees* this general remark may be made, that those which grow slowly, and in dry and stony or rocky soils and situations, have their wood more firm, heavy, and lasting, than those which grow quickly and in deep moist soils. Even the same kind of trees, thus differently situated, produce woods of very different qualities; attempts have been made, in this country, to accelerate the growth of oak and some other trees; but although quick-growing oak is doubtless very valuable for many purposes, yet the wood of that which grows slowly will be found generally the most lasting. Some trees will scarcely grow at all in moist clayey soils, such are the oak and the hazel;

while the willow, and the poplar in particular, and the elm, flourish best in soils having a deep clayey bottom. The time of *felling* trees is also of some moment; in this climate, the best time is about Christmas, or soon after, although oak, for the purpose of obtaining its bark more readily, is usually felled and barked in the spring: that this injures the wood admits of no question.

OAK. The uses to which oak is applied are numerous. It will endure all weathers and seasons, hence it is used for purposes that are liable to such exposures; as posts, rails, boards, pales, wheel-spokes, hoops, buildings, &c. For water-works it is second to none, or where exposed to both wind and water, as ship-building, &c. The bark and saw-dust are useful to the tanner and dyer; and the ashes make a good ley for washing.

ELM is of use for water-pipes, pumps, and ship's blocks. It makes good chopping-blocks, not being liable to break and fly off in chips. It is used for axletrees and fellies for wheels. Carvers use it for foliage and curious works; and it is made into coffins; it is also used for flooring rooms. A decoction of the inner bark of the common elm has been recommended in scorbutic, scrofulous, and nephritic complaints.

ASH is of almost universal use, particularly where it may lie dry, though often used in other situations. It serves the builder, carpenter, cooper, turner, wheelwright, &c. but more especially the plough-wright; and at sea it is used for oars and hand-spikes. It possesses great toughness and flexibility.

BEECH is used among turners, joiners, and upholsterers. For uses under water it is said to outlast the oak. Of the bark floats are made for fishing nets, instead of cork. It also serves for a variety of domestic purposes, and was in great estimation among the ancients. The leaves of the beech continue long sweet, and make good mattresses. An oil may be extracted from the *mast*, or nut, which serves also to feed swine. The wood is of a clean fine grain, and can be cut so thin, that it makes band-boxes, hat cases, and even book covers, and scabbards for swords.

WALNUT is of general use in France. It is not so proper for the outside of buildings, but there is no wood better for the joiners. It is also used for making gun-stocks. It is less subject to the worms than beech, and is of a more curious brown. The hickory nut, or white Virginia walnut, is very common in various parts of North America. See page 50.

CHESTNUT-TREE is very lasting, and is much sought after by carpenters and joiners. It is esteemed next after the oak; but while it appears fair without, it will decay inwardly. Great part of London was anciently built with chestnut. Excellent starch may be made from horse chestnuts.

POPLAR, *Abele*, or *Abby*, and *Aspen*, all belong to the genus *Populus*, and differ little from each other, but aspen is the most lasting, being tougher and harder than deal. The timber is excellent for all sorts of white wooden vessels. The wood of the *Lombardy* and *Canadian* poplars is light and spongy; and is said not to be liable to worms. It has something of the nature of cork, and is used by some countrymen as soles for shoes.

ALDER is used for water-pipes and sluices: anciently boats were made with it, and large vessels. It is useful for trays, trenchers, and

wooden reels. The dyers make the bark useful. Alder endures water, and if always wet, it becomes hard like a stone; though if it be wet and dry alternately, it rots presently.

BIRCH-TREE. There are many species of birch. The common birch tree (*Betula alba*) may be cultivated upon barren land, where better trees will not thrive; for there is no ground so bad, but this tree will thrive in it. It will grow in moist springy land, or in dry gravel or sand, where there is little surface. So that upon ground that produced nothing but moss, these trees have succeeded so well, as to be fit to cut in ten years after planting, when they have sold for near ten pounds per acre, standing, and the after produce has been considerably increased.—Many woods near London, which were chiefly stocked with these trees, having been of late years grubbed up, the value of these plantations has advanced in proportion. Persons, therefore, who are possessed of poor land, cannot employ it better than by planting it with these trees, especially as the expense of doing it is not great. Broom-makers are constant customers for birch. Hoop-benders are also great purchasers. The largest trees are often bought by the turners; and the wood is used for making ox-yokes, and other instruments of husbandry. In some of the northern parts of Europe, the wood of this tree is greatly used for making wheels for carriages, being hard, and of long duration. In France, it is generally used for making wooden shoes, and is good fuel. In some places, these trees are tapped in the spring, and the sap drawn to make birch wine, formerly considered useful in nephritic complaints; but as a medicine, it is of no importance; as an English wine, however, when the juice is properly fermented with yeast, it may form a pleasant variety. The juice is obtained thus: about the beginning of March, cut a slit almost as deep as the pith, under some well-spreading branch: cut it obliquely, and not lengthwise, and insert a small stone, or chip, to keep the lips of the wound a little open; lastly, to this orifice fasten a bottle, into which will distil a limpid and clear fluid, having a slight taste and odour of the tree. It is said that in the space of twelve or fourteen days, as much juice will be gathered, as will outweigh the whole tree, body and roots.

LARCH-TREE, or *Pinus larix*, grows naturally upon the Alps and Apennines, and has lately been much propagated in England. In many places ships are built of this wood, which are said to be durable; and, therefore, this may be a very proper tree for planting upon the cold barren hills of England; which, beside the profit they would yield to their proprietors, would also conduce to national benefit.

PINE, a general term for an important genus of trees, all of which have the characteristic of the *Fir* tree, so well known in this country. From several species of the pine is procured the common turpentine. The leaves and tender tops of pine and fir are used for diet drinks. Pitch, tar, resin, and oil of turpentine, are all the product from these trees by very familiar methods, which have been described under their respective heads.

FIRS are, of course, species of the pine. The *Scots fir* yields a red or yellow deal, of great durability; it grows wild in Scotland. The *silver fir* grows about Strasburg and other parts of Germany, whence the turpentine is brought to England. The *Norway*, or *Spruce fir*, is common to the woods of Norway, and affords the white deals. Several other species are also called *Spruce fir;* three of

these, the *Pinus alba*, *nigra*, and *rubra*, are natives of North America; from the last two is obtained the *Essence of Spruce* of the shops, a black extract of the consistence of treacle, with which, and molasses and water, and the addition of yeast, is made *Spruce-beer*. *Hemlock-spruce* is an elegant tree, a native also of North America; its bark is used in tanning.

Of the OSIER, WILLOW, or *Salix*, there are many species. Linnæus enumerates seventy. The weeping-willow grows naturally in the Levant, and has been for many years cultivated in English gardens. Most willows thrive best in moist and deep clayey soils, but some will thrive upon the highest hills, thence called mountain osier. The wood of this is converted into charcoal, for making gunpowder and drawing-pencils. The Laplanders make a sort of leather of the bark, which they manufacture into gloves. The bark of several species of the willow has been found useful in agues and other complaints; the London College orders that of the *Salix fragilis*, or crack willow only. Willows, in the spring season, when they are in flower, produce a quantity of cottony matter, which the Chinese collect as it falls from their willows; and the women and children among the poorer people card it, &c., and render it fit for many uses. With us, the willow is used chiefly in rods for making baskets; but in the districts of this country where it grows abundantly, the rods are used for many other purposes.

HOLLY, or *Ilex aquifolium*, is a beautiful tree in the winter; it grows naturally in the English woods and forests, where it rises from twenty to thirty feet high. The seeds of the holly never come up for the first year, but lie in the ground as the haws do. The berries therefore should be buried in the ground one year, and then taken up and sown at Michaelmas in a bed where the plants may remain two years, and then be transplanted. *Holly hedges* are a beautiful evergreen and strong fence; but they are liable to perish in hard winters, owing chiefly, it is supposed, to the field mice, which, for want of other food, eat off the bark from the roots. *Holly* is the whitest of all hard wood; it takes a fine black, and a good polish, and is therefore used by the inlayers. It is also fit for all strong uses, and hence preferred to all others by the mill-wright, turner, and engraver. It makes the best handles and stocks for tools, flails, cart-whips, bowls, shivers, and pins for blocks: and is excellent for door-bars, &c. *Bird lime* is also obtained in this country, chiefly from the inner bark of this tree.

There are many other timber trees, such as *Sour-gourd*, or *Monkey's Bread*, &c., which we cannot particularize. Mr. Ray, and other authors, speak of trees of prodigious bulk. The Jesuit d'Acosta, in his History of the Indies, mentions a hollow tree in New Spain, nine fathoms within side, near the ground, and sixteen without side. He adds, that it is under this tree the barbarians assemble to perform their religious ceremonies, dance round their idols, &c. Herrera mentions another which sixteen men joining hands could not encircle. F. Kircher affirms, he has seen a tree near Gonzano, which would lodge a whole family of twenty-five persons in its cavity. The common people have a tradition that it was planted by Augustus. In the Indies there are single trees the branches of which, bending to the ground, take root, and put forth new trees: the *Banyan*, *Ficus Indica* or Indian fig tree, is of this kind. This tree

has been immortalized by MR. SOUTHEY in his *Curse of Kehama.* One has been described on an island in the river Nerbudda in the East Indies, the largest trunks of which, exceeding our noblest oaks in size, amount to 350, and 7,000 persons can be covered by its shade, and its abundance of fruit can supply the same number of persons with food.

In Peru there are trees, according to M. Lonvillers, one part of the branches of which produces fruit one half the year, and the other part the other half.

In concluding our account of *Timber trees* we must not omit to mention

The TEAK, or *Tectonia grandis*, a native of the East Indies, which grows to a great size, and a vast height. The wood is eminently useful in India, affording the only timber which the white ant will not touch; it is in fact to India what the oak is to England, and, like the oak, is used very generally for ship-building, and all other purposes where a strong and durable wood is required. The growth of the tree is very rapid, and at all ages the wood is excellent. It is propagated by seeds; and deserves the attention of the West Indian and African planter.

BIRD-LIME is a glutinous and viscid matter of a peculiar kind, used for the purpose of entangling birds. It is prepared from various substances and in various ways, but chiefly from the bark of holly, which is boiled in water for ten or twelve hours, by which the green outer coat is separated from the inner. The latter is then covered up a fortnight in a moist place; after which it is pounded into a uniform paste, washed in water, fermented four or five days, and laid up for use. When used it is mixed with a third of its weight of nut-oil, or thin grease. The mistletoe; the shoots of alder; the roots of all the hyacinth tribe; the asphodel, narcissus, and black bryony-root, yield also bird-lime. Common bird-lime, however, not resisting humidity, a kind called water bird-lime is used. It is prepared by washing, drying, and mixing the common kind with capon or goose grease, adding a little vinegar, oil, and turpentine, and boiling them slightly, after which it is used warm for snipes and other birds that frequent wet situations. Good bird-lime is of a greenish colour and sour flavour; its smell is peculiar, and does not, as stated by many writers, resemble *lintseed-oil*, nor any other substance with which we are acquainted. It is closely allied to gluten in its natural qualities, being insoluble in water and alcohol, but it may be dissolved in sulphuric ether. Natural bird-lime is found on the bark of the *robinia viscosa.*

CHARCOAL being usually obtained from wood, naturally follows the description of timber trees. The uses of charcoal for making powerful fires to melt metals, in the manufacture of gunpowder, polishing copper or brass, &c., are well known. The charcoal of commerce is black and sonorous; by the microscope it is discovered to be very porous, and to this cause must be ascribed its colour, as the rays of light striking the charcoal are absorbed instead of being reflected: blackness in a body being occasioned by its want of reflective powers. Both the gravity and colour, however, of charcoal, vary according to the species of timber, and the delicacy of the process of charring, some of it being lighter or heavier, brighter and more sparkling or duller, than others. Charcoal employed as fuel is usually made of oak, chestnut, elm, beech, or ash wood, the white or resinous woods being

seldom used; young wood affords a better charcoal than large timber. It is cut into suitable lengths and formed into a conical pile, which being covered with earth or clay, is suffered to burn, with a limited access of atmospheric air, by which its complete combustion, or reduction to ashes, is prevented. Good charcoal retains the original shape of the wood. Another and more perfect mode of preparing charcoal is by distillation, in cast iron cylinders made red hot in a strong fire, by which means the gaseous or volatile contents of the wood are preserved, while the charcoal is more pure, and fitter for gunpowder. According to the experiments of Messrs. ALLEN and PEPYS, (Phil. Trans. 1807,) from 100 parts of the following woods they obtained the annexed quantities of charcoal; the decimal parts are omitted; beech 15, mahogany 15, lignum vitæ 17, oak 17, fir 18, box 20.

Besides the uses of charcoal already specified, it is found very useful in correcting the fetid odour of putrefying animal and vegetable bodies; it also destroys the smell, taste, and colour of many substances, both vegetable and animal. As a medicine it is antiseptic, and has been given for this purpose in the putrid eructations of dyspepsia. It is also advantageously mixed in poultices for foul ulcers; it is also a good tooth-powder.

Charcoal, in whatever manner prepared, generally contains about one-fifth of its weight of earth, salts, or metallic matters. Its other constituents are CARBON (which is pure charcoal) 68.4, *Hydrogen* 1.5, and a minute portion of oxygen. Carbon, therefore, is the chief constituent of charcoal; and is found, not only in the vegetable, but the animal and mineral kingdom; it is considered a simple body, never having been decomposed. Carbon combined with oxygen forms *carbonic acid*, which is evolved so plentifully from vegetable juices when undergoing the vinous fermentation; see FERMENTATION and BLOOD.

PYROLIGNOUS ACID may also be mentioned as an important and useful condiment, &c. obtained from wood. See VINEGAR.

COKE is mentioned under the article COAL; but being a mineral charcoal, prepared from pitcoal in the same way, and used for similar purposes as the vegetable, we notice it here more at large. The suffocating effects of charcoal or coke fires in factories are to be attributed partly to their rapid consumption of oxygen gas, and partly to the carbonic acid gas produced by the union of the oxygen with the carbon, which, from its weight, does not readily pass up a chimney, unless the draught be very powerful. Many persons have been suffocated by sleeping in a room with a charcoal fire. When such an accident happens, water should be thrown about in the room, to absorb the carbonic acid gas, and the persons brought into the open air as quickly as possible; see page 108. Charcoal and coke, when perfectly pure, are called, in chemical language, CARBON, and are virtually the same. But coke is a much more impure carbon than charcoal. See the last article.

The coke obtained from the gas works is very inferior, as fuel, to that made in the mining districts of this country.

POLYPUS.—CORAL.—SPONGE.

ZOOPHYTES are those natural productions which, although fixed to a particular spot, and appear to grow like vegetables, yet ap-

proach, nevertheless, in many respects to animals, and are so considered by most naturalists. *Tubipores, Madrepores, Corals, Sponge,* and many other marine productions are ZOOPHYTES. The POLYPUS, too, is one of the most singular of the Zoophytic class: of this there are several species; some are found in fresh, some in salt water in this country. The whole genus has the wonderful facility of reproducing parts which have been destroyed, and if cut and divided in any direction, each separate part becomes a perfect polypus.

CORAL is considered by some as a marine *plant*, by others as an *animal* production; to which of the two it belongs, it is not easy to determine: it is, however, decidedly a zoophyte. The roots of coral are covered with a bark, beset with starry pores. The tree part is divided into branches. The genus *Isis*, or coral, in the order of zoophytes, or composite animals, efflorescing like vegetables, is an animal in the form of a plant, with a stony stem, jointed, and the joints longitudinally channelled, united by spongy or horny junctures, covered by a soft porous cellular flesh or bark, and having mouths beset with oviparous polypes. Corals, in a later nomenclature, have been called

CORALLINIADÆ, and arranged under eleven genera, consisting of several species and varieties. In Cook's Voyages are described immense and dangerous rocks of coral in the Southern Ocean, which rise perpendicularly like walls. Indeed, many islands in the Pacific Ocean are composed entirely of this substance. There are three kinds; red, white, and black. The white is the rarest and most esteemed. The red has been employed as a medicine. The *Corallina officinalis*, or *Sea-moss*, found attached to rocks on our own shores, was also formerly used as an absorbent, but is now rejected. With us, coral is now only used as chaplets, beads, and other toys. The places for fishing coral are in the Persian Gulf, Red Sea, coast of Africa, the isles of Corsica and Majorca, and some parts of the Spanish coast. The time for fishing is from April to July. The method used under the direction of the company at Marseilles, in France, is as follows. Seven or eight men go in a boat, commanded by the patron or proprietor; the caster throws his net, or machine, and the other six manage the boat. The net is composed of two beams tied across, with a leaden weight to press them down: to the beams is fastened a great quantity of hemp loosely twisted round, among which they mix some strong nets. In this condition the machine is let down into the sea, and when the coral is strongly entangled in the hemp and the nets, they draw it out by a rope. It sometimes requires half a dozen boats to draw it up, and if the rope happen to break, the boats are in great danger of being upset.

Corals appear to consist of carbonate of lime and animal matter in equal proportions.

Artificial coral is made of cinnabar well beaten, a layer whereof is applied on a piece of wood, moistened with size, dried and polished, and lastly rubbed over with the white of an egg.

SPONGE has been already mentioned in page 91; it may be described as fixed, flexible, torpid, elastic, of various forms, composed either of reticulate fibres, or masses of small spines interwoven together, and clothed with a gelatinous flesh full of small mouths on its surface, by which it absorbs and rejects water. It is found adhering to rocks, shells, &c. under cover of sea-water, and it is dis-

tinguished into coarse and fine. Naturalists were embarrassed whether to range sponge in the animal, mineral, or vegetable kingdom. But it is now decidedly allowed to belong to the first, and to be a particular genus in the order of zoophytes. Many sponges are found on the shores of the British seas; but most if not all of the sponge of commerce is brought from the Mediterranean, especially from Micaria, an island near the coast of Asia. Diving or fishing for sponge is there reckoned the chief qualification of youth. The fine or small sponges are most esteemed; and usually come to us from Constantinople. Their goodness consists in being white, light, and the holes small and close; the larger and coarser come from the coast of Barbary, particularly Tunis and Algiers. Sponge taken inwardly chokes, and certainly kills, by swelling and preventing the passage of the food into the intestines.

All the numerous tribe of zoophytes appear to consist of gelatinous or albuminous matter, hardened by different proportions of carbonate or phosphate of lime.

Woollen, Silk, Cotton, and Flax Manufactures.

The artificer must not here expect to find the exact weight or quantity of each ingredient, nor the whole process minutely described, from which he may make experiments. This work is compiled, not so much for the artificer or mechanic, as for the young scholar; and, consequently, it is intended to convey only general, not particular directions.

WOOL is the convoluted hairy covering of sheep, or other animals, which, after being washed, shorn, dressed, combed, and spun, is woven into various kinds of stuffs, cloths, &c. for apparel and furniture. Wool, in the state in which it is shorn off the sheep, and not sorted into its different kinds, is called a *fleece*. Each fleece consists of wool of various qualities and degrees of fineness. The finest grows on the poll of the sheep, the coarsest about the tail, the shortest on the head and on some parts of the belly, the longest on the flanks. The weight of *fleeces* varies exceedingly: some *long* wool fleeces weigh as much as eleven pounds; this wool is coarse; others weigh no more than two or three pounds each; such are usually the finer kinds. Wool is either shorn, or pulled off the skin after the sheep is dead. When short, it is used for hats, and not in the manufacture of cloth, unless mixed with longer wool. Among the ancients the wools of Attica, Megara, Laodicea, Apuleia, and especially those of Tarentum, Parma, and Altino, were the most valued. Varro assures us, that the people of Tarentum used to clothe their sheep with skins, to secure the wool from being damaged; and Tavernier affirms, that the wools in Asia are incomparably finer than those of Europe; and hence it appears probable, that wool was the golden fleece sought for at Colchis. The art of preparing and working wool was attributed by the ancients to Minerva; who, accordingly, is made the genius and protectress thereof.

The wool from *Spanish* or *Merino* sheep is deservedly esteemed as some of the finest. So also is the wool now imported from *New Holland* and *Van Diemen's Land*, the produce of sheep now reared there, which, if not equal to the wool produced in Spain, is yet very valuable,

and is become a considerable article of trade. The origin of the term *Merino*, or of the sheep so called, is not precisely known. Dr. PARRY thinks that Merino sheep came originally from Italy; the race of the short woolled sheep of the ancient Romans being apparently the same.

The most esteemed fine *wools* of *England* are those obtained from sheep of the *Ryeland* and *South Down breeds*, or from *Merino* sheep imported into this country. For wools, however, adapted to the manufacture of the useful and coarser cloths, no country in the world appears superior to England. Indeed, some of our finer wools produce cloths which vie with those made from the pure Merino: but it cannot be, nevertheless, disguised, that luxury still demands the foreign article.

Of late the English fleece has, however, been greatly improved by crossing the breed with Spanish Merino and English fine-woolled sheep; the offspring of this mixed breed yielding wool in some respects superior to the best in Spain. The English sheep are of two kinds; one yields fine short clothing, the other coarse, long, combing wool. The South Down, Hereford, and Norfolk breeds belong to the first: the Lincoln and Leicestershire to the last. Anciently, the principal commerce of the nation consisted in unmanufactured wool; which foreigners, especially the French, Dutch, and Flemish, bought of us; so that the duty on English wool exported in Edward the Third's reign, amounted, at 50*s*. a pack, to 250,000*l*. per annum —an immense sum in those days. This excessive duty on the export of unmanufactured wool induced foreigners to come to this country, and the English, to attempt to manufacture it themselves, in which they succeeded so well, that toward the close of the sixteenth century, in the reign of Queen Elizabeth, all exportation of wool was absolutely prohibited; and this, upon pain of having the right hand struck off. Since which time, till lately, England has been exceedingly jealous of her wool. It is said that to prompt their vigilance, the judges in parliament are seated on wool-packs. But more liberal and enlightened measures now prevail: wool may be exported at the present time (1828) without risk or penalty.

Wool consists of albuminous matter. It appears to owe its peculiar quality of fulling or felting to its structure, which is either that of zones projecting one beyond another, from the root to the top like horns, or rigid laminæ laid over each other like tiles, or the scales of fishes. Wool also contains a considerable quantity of unctuous matter, which can be dissolved in alkaline ley, and made into soap; but its smell is so offensive as to preclude its use. Yet, such is the roughness of the surface of the filaments of wool, that it is necessary to cover them with a coat of oil or grease, in order to make them sufficiently smooth and straight to be spun into yarn. When the stuff is finished from the loom, it is then put into the fulling mill, where it is cleansed with fullers' earth and water.

THE WOOLLEN MANUFACTURE

Includes the several sorts of commodities into which wool is wrought: as *Broad and narrow cloths*, single and double milled *Cassimeres*, or *Kersymeres*, baize, serges, flannels, carpets, stuffs, stockings, caps, rugs, &c. The woollen manufactures, which constitute much of our

foreign and domestic trade, had their rise here in the fourteenth century. Till that time, almost all our wool, except some for coarse purposes, was sold in the fleece, to such of our neighbours as came to buy it. Among our customers, however, the principal were the Flemings and Brabanters; and particularly the merchants of Ghent and Louvain, who took off vast quantities to supply two manufactures that had flourished in those two cities from the tenth century; and had furnished the greatest part of Europe, and even England itself, with all sorts of woollen cloths, &c. But civil dissensions drove many of the artisans from Ghent, who removed to England, where they instructed our people how to work their own wool. This, it is said, occurred in the year 1420; from which time no endeavours have been spared to keep our wool to ourselves. The places for the manufacture of woollen goods in this country are very numerous; many towns in Devonshire, Somersetshire, Wiltshire, Gloucestershire, Warwickshire, Yorkshire, and Lancashire, are particularly noted for one branch or another of this trade; Wales is distinguished for flannels, and Norwich and London for shawls.

CLOTH, in commerce, in its general sense, includes all kinds of clothing woven or manufactured in the loom, except silk; whether the threads be of wool, cotton, hemp, or flax. Cloth is, however, more peculiarly applied to woollen threads interwoven; some of which are called the *warp*, and extend lengthwise, from one end of the piece to the other: the others are called the *woof*, and disposed across the first, or breadthwise of the piece. Cloths are of various qualities, fine, coarse, strong, &c.; some are of different colours; others are wrought white, and afterwards dyed in the piece. Their breadths and lengths are various. The goodness of woollen cloth consists in the wool being fine and well dressed; in its being spun equally, always observing, however, that the thread of the warp be finer and better twisted than that of the woof; in its being well cleared of the knots and other imperfections, and well cleansed with fullers' earth, and afterwards properly dyed, dressed, and pressed.

Cloth is distinguished by being either *plain* or *kersey* woven. The first method consists simply in the threads crossing each other at right angles; in the last they are crossed so as to give an additional strength to the cloth; hence it appears in diagonal lines or rows running obliquely across the piece; and, in general, this style of weaving adds thickness as well as strength to the fabric. In the cotton manufacture cloth so woven is called *twilled*.

Manufacturing of white cloths for dyeing.—The wool is first scoured in a liquor composed of three parts of water, and one of urine; it is then drained, washed in running water, and hung out to dry in the shade. When dry, it is beaten with rods on hurdles of wood, or on ropes, to clear out the dust and grosser filth. After beating, it is well picked, to clear the rest of the filth that had escaped the rods. It is now oiled, and carded on large iron cards, placed aslope. The best oil for the purpose is olive oil. The wool is now given out to the spinners, who first card it on the knee with small fine cards, then spin it by a wheel, observing to make the thread for the warp smaller than that for the woof, and much closer twisted. When warped, it is stiffened with *size:* that which is made with shreds of parchment is the best. When dry, the weavers mount it in the loom. Formerly there were two weavers to each loom, one on each side, treading at

the same time alternately on the same treadle; i. e. now on the right step, and now on the left, which raised and lowered the threads of the warp equally; between which they threw, transversely, the shuttle from one to the other. This, however, is now performed by one person, by means of what is called a flying shuttle. Each time that the shuttle is thrown, so that a thread of the woof is inserted within the warp, he strikes it with the frame wherein the comb, or reed, is fastened, between the teeth of which the threads of the warp are passed, repeating the stroke as often as is necessary. The weaver having continued his work, till the whole warp is filled with woof, the cloth is finished. It is then taken off the loom by unrolling it from the beam whereon it had been rolled in proportion as it was woven, and given to be cleared of the knots, ends of thread, straws, and other filth, which is done with little iron nippers. In this condition it is carried to the fullery, to be scoured with urine, or fullers' earth well cleaned and steeped in water, put along with the cloth into the trough, wherein it is fulled; and after undergoing a variety of other manipulations and processes necessary to the perfection of the cloth, and being also dyed of the particular colour desired, it is ready for the market.

The above is the usual process of weaving woollen cloth in the small way, as formerly, as well as now sometimes practised; but the ingenuity of modern times and the steam-engine have very materially altered many of the processes above described. The *spinning* in particular is now, in our large manufactories, no longer performed by the hand and the wheel, but a method is adopted by which one person can direct the spinning of thirty or more threads at once, and this so regularly and expeditiously as to set at naught the former practice. The machinery of such spinning is moved by steam, as indeed is even the carding of the wool, and many other processes not formerly thought capable of being brought to machinery subjection.

For the manufacture of *mixed cloths*, or those wherein the wools are first dyed, then mixed, spun, and woven, of the colours intended, the process, except in what relates to the colour, is mostly the same with that just spoken of: the method of adjusting the mixture is by first making a felt of the colours of the intended cloth, as a specimen; the wool of each colour is weighed, and when the specimen is to the manufacturer's mind, he mixes, for use, a quantity in the same proportion; estimating each grain of the specimen at twenty pounds' weight of the same cloth to be made.

BAIZE is a kind of coarse, open, woollen stuff, having a long nap; sometimes friezed on one side, and sometimes not, according to the uses for which it is intended; it is of various colours, *white*, *green*, &c. It is without wale, being wrought on a loom with two treadles like flannel. The manufacture of baize is very considerable in England, and in Flanders about Lisle and Tournay, &c. Formerly the French, as well as the Italians, were furnished with baize from England; but for some time the French workmen have undertaken to imitate it, and set up manufactures of their own, and with success, especially at Nantes, Montpellier, &c. The export of baize is very considerable to Spain, Portugal, and Italy. Its chief use is for the religious, and for linings in the army; the looking-glass makers also

use it behind their glasses, to preserve the tin or quicksilver; and the case-makers to line their cases.

SERGE is *kersey* wove, and either white, coloured, or figured. Coloured serges and figured *Duroys* were very commonly worn by the lower order in the west of England some years ago; but these manufactures have been superseded by *bombazets* and printed cottons. White serge is however still in use, and is a useful and durable material, superior in strength to flannel or baize.

BOMBAZET, a woollen manufacture of various colours, now much worn; some of it is got up to look glossy and very much like silk; it is a valuable and useful manufacture. It is commonly woven plain, sometimes however it is twilled.

WORSTED is a kind of hard-twisted and doubled or trebled woollen thread. It is chiefly used either to be knit or woven into stockings, caps, gloves, and the like. The name worsted is supposed to be derived from the town of Worstead in Norfolk, noted for fine spinning. They who write it *woolsted*, do it on a supposition of the word being formed from wool, the matter of this thread.

FLANNEL, a kind of soft, slight, loose woollen stuff, but very warm, composed of a woof and warp, and woven on a loom, with two treadles, after the manner of baize. *Welsh* flannel for softness and durability is generally preferred; although very good flannel is made in many other places of the empire; at Rochdale and in the west.

CALAMINCO, or MINCO, a sort of woollen stuff manufactured in England and Brabant. It has a fine gloss, and is chequered in the warp, whence the checks appear only on the right side. Some calamincoes are quite plain, others with broad stripes, some with narrow stripes, and others watered.

TAPESTRY is a curious kind of manufacture, formerly used to adorn a chamber or other apartment, by hanging or lining the walls. The term is appropriated to a kind of woven hangings of wool and silk, frequently raised and enriched with gold and silver, representing figures of men, animals, landscapes, &c. The invention of tapestry seems to have come from the Levant: and what makes this the more probable is, that formerly the workmen concerned therein were called, at least in France, Sarrazins, or Sarrazinois. It is supposed that the English and Flemish, who were the first that excelled in this manufacture, brought the art with them from the crusades or expeditions against the Saracens. Be this as it may, it is certain those two nations, particularly the English, were the first who set on foot this noble and rich manufacture in Europe. Hence, if they be not allowed to be the inventors, they have, at least, the glory of being the restorers of so curious and admirable an art, which gives a kind of life to wool and silk scarcely inferior to the paintings of the best masters. It was late before the French applied themselves to tapestry. The first establishment of that kind was under Henry IV., in the year 1607, in the Fauxbourg St. Michael. Two methods are adopted in weaving tapestry: in the *high warp* the cloth is woven *perpendicularly*, in the low warp *horizontally*. The low warps in Flanders have been said to exceed those of France. The chief are at Brussels and Antwerp, where they have succeeded in human figures, animals, and landscapes, equally in the designing and workmanship. It would be difficult and tedious to give a clear idea of the loom, or the manufacture of tapestry; it may be observed, however, that it is all wrought on the wrong

side; so that the workman cannot see the right side of his tapestry till the piece is finished, and taken off the loom.

The GOBELINS is a celebrated manufacture of tapestry, now the only one in Europe of any note, which was established at Paris in the reign of Louis XIV. The house, where this manufacture has long been carried on, was built by two brothers, Giles and John Gobelin, both excellent dyers, and the first who brought to Paris the secret of dyeing that beautiful scarlet colour, still known by their name. In 1667 this place changed its name from Gobelins to Hotel Royal des Gobelins by an edict of Louis XIV.

CAMLET or CAMBLET is a stuff made of hair, silk, or wool. In some, the woof is hair; the warp, silk and wool twisted together. Camlets are manufactured in Holland and Flanders, and in Ireland and England. The true or oriental camlet is made of the pure hair of a sort of goat, frequent about Angora, in Natolia, and which makes the riches of that city. Middle-age writers mention stuff made of camel's hair, under the denomination, of *cameletum* and *camelinum*, whence it was supposed the term was given; but these are strangely coarse, rough, and prickly, and seem to have been used among the Monks by way of mortification, as the hair shirts of later times. We have no camlets made in Europe of the goat's hair alone; even at Brussels they find it necessary to add a mixture of woollen thread. *Figured camlets* are those of one colour, whereon are stamped various figures, flowers, foliage, &c., by means of hot irons, which are a kind of moulds passed together with the stuff under the press. Camlets are now very little heard of in this country.

MOHAIR, a kind of stuff, generally of silk, both woof and warp, having its grain woven very close. There are two kinds of mohair; the one smooth and plain, the other watered like tabbies. The difference between the two consists only in this, that the latter is calendered, the other not. There are also mohairs, both plain and watered, the woof of which is woollen, cotton and thread.

A CARPET is a beautiful figured cloth, used for covering the floors of rooms, stairs, &c. generally composed of woollen stuff, either wrought in a loom, or with the needle. Formerly there were Persian and Turkish carpets made of silk, and some are still made of this substance, and of hair; but the principal part are now made of coloured woollen yarn, manufactured into divers patterns and figures, often approaching to those of tapestry. In Germany, carpets are made of wool, and embellished with silk in needle-work. But the first and most extensive manufactures of carpeting exist in England, particularly those at Axminster, Wilton, Kidderminster, &c. There are three principal sorts of carpeting: the Turkey, the Wilton or Brussels, and the Kidderminster or Scotch. Both the first and second have smooth backs, and a nap on one side. The Turkey is distinguished by a very thick nap; it is the dearest, the warmest, and the most durable. The Brussels, as it is called, though manufactured in England, has now nearly superseded the Wilton. The best of the Kidderminster and Scotch carpets are woven double, without any nap, so as to be similar in texture on both sides, and similar in pattern, the colours only being reversed. These are cheaper than the Brussels or Wilton, and nearly as durable. Carpets are sometimes woven in one piece for a room, with a border; but most commonly they are woven in long pieces, which are afterward sewed together to make

the breadth desired. At Axminster and in London excellent carpets of the Wilton or Brussels, as well as of the Turkey kind, are made of the largest dimensions, suited to the full extent of drawing-rooms, all in one piece. The large carpets are made on frames and rollers, somewhat similar to tapestry. Carpet making has become a very flourishing, and valuable manufacture, which employs a great number of industrious people, and, being almost wholly performed with the produce of our own country, is of great importance as a national concern. Carpets having hair or shag on one side only were called by the ancients *tapetes*, those with shag on both sides, *amphitapetes*. The use of carpets is of great antiquity, and they were no less a luxury among the ancient Greeks than among the moderns. They also give an appellation to a kind of knights, who being mercantile or professional men, not addicted to the art of war, receive the honour of knighthood from the king's hands, kneeling at court on a carpet, and hence called *Carpet-Knights*.

Silk,

A very soft, fine, bright, delicate thread, the production of an insect or moth, called by the ancients *bombyx*, by the moderns *phalæna mori*, or *silk-worm* (see Mulberry.)

The ancients were but little acquainted with the use and manufacture of silk. The art of manufacturing silk was first invented in the isle of Cos, and Pamphila, the daughter of Platis, is honoured as the inventress. The discovery was not long unknown to the Romans. Silk was brought to them from Serica, where the worm was a native. But so far were they from profiting by the discovery, that silk was a very scarce commodity among them for many ages: it was even sold weight for weight with gold; so that Vopiscus tells us, the emperor Aurelian refused the empress, his spouse, merely on account of its dearness, a suit of silk, which she solicited of him with much earnestness. At length two Monks coming from the Indies to Constantinople, in 555, brought with them great quantities of silk-worms, with instructions for the hatching of their eggs, rearing and feeding the worms, drawing out the silk, spinning and working it. Upon this, manufactures were established at Athens, Thebes, and Corinth. About the year 1130, Roger, king of Sicily, established a silk manufacture in Palermo, and another in Calabria; the rest of Italy and Spain learned from the Sicilians and Calabrians the management of silk-worms, and the working of silk; and at length the French, a little before the reign of Francis I., began to imitate them. James I. was very desirous of introducing the culture of the mulberry, and the feeding of silk-worms, into this country, and the subject was recommended several times from the throne, but no efforts hitherto made have been successful: see Mulberry.

To wind the silk from off the cocoons, two machines are necessary: the one a furnace with its copper; the other a reel, or frame to draw off the silk. The winder, seated near the furnace, throws into the copper of water over the furnace (first heated and boiled to a certain degree) a handful or two of cocoons, which have been well purged of their loose furry substance. These cocoons contain the young silk-worm, which, if not killed, would eat its way out of each, and thus destroy the silk. The person placed to wind them stirs the whole very

briskly about with birchen rods, bound and cut like brushes; and when the heat and agitation have detached the ends of the silk on the cocoons, which are apt to catch on the rod, he draws them forth, and joining ten, twelve, or even fourteen of them together, forms them into threads, according to the thickness required in the works for which they are destined: eight ends sufficing for ribbons; and velvets, &c. requiring no less than fourteen. The ends, thus joined into two or three threads, are first passed into the holes of two or three iron rods in the fore part of the reel, then upon the bobbins or pullies, and at last are drawn out to the reel itself, and there fastened, each to an end of an arm or branch of the reel; all silks cannot be spun and reeled after this manner: either because the balls have been perforated by the silk-worms themselves, or are double, or too weak to bear the water; or because they are coarse, &c. Of all these together is made a particular kind of silk, called *floretta;* which being carded, or even spun, in the condition it comes from the ball, makes a tolerable silk.

The several preparations which silks undergo, to fit them to be used in the manufacture of silken stuffs, are the spinning, reeling, milling, bleaching, and dyeing.

Silk is distinguished by different names, according to its different states.—Thus *raw silk* is that taken from the ball without fire, and wound without any boiling; such as is most, if not all, that is brought into England from the Levant and India, as well as a considerable portion of what comes from Italy and Spain. The principal part of raw silk is afterwards sent to a mill to be *thrown;* that is, to have two threads of it doubled and twisted together, by which it is converted into tram or *organzine*, according to the fineness of the silk, and the purposes to which it is intended to be applied in the manufacture.

The silk trade is the principal in China, and that which employs most persons; but the European merchants, who deal in it, especially in wrought silks, are careful of the spinning, &c., the waste being usually very great. The silks in the states of the great Mogul are brought mostly from Kasem-bazar. The silk of Kasem-bazar is yellowish, like that of Persia and Sicily, there being none naturally white, but that of Palestine. The Indians, however, whiten it with a ley made of the ashes of a tree, called Adam's fig-tree; but as this tree is rather scarce, the Europeans are forced to take the greater part of their silks in the native yellow. Kasem-bazar alone is computed to furnish every year 22,000 bales of silk, each bale weighing 100lbs.

The quantity of silk imported and employed in our various manufactures is surprisingly great. The total exceeds, on an average of the last thirty years, one million of pounds annually, varying in price from twenty to sixty shillings or more per pound. During the year 1828, the quantity of imported silk amounted to 4,547,500lbs.

Spider-silk. The method of procuring and preparing silk of the webs of spiders was made public by M. Bon, who says, that the silk-spider makes a silk as beautiful, glossy, and strong, as the silk-worm: from the papillæ at the end of the abdomen, the spider throws out at pleasure a number of fine threads, which it unites in various ways for the purpose of entangling its prey. By collecting a quantity of their bags, he says, a new silk may be made, that will take all kinds of dyes, and may be made into all kinds of stuffs. M. Bon had stock-

ings and gloves made of it, which he presented to the French Academy; and others to the Royal Society. It was, however, soon found to be impossible to rear spiders in any quantities as they destroyed each other, whenever they had not flies to prey on.

SATIN is a kind of thick silken stuff, very smooth and shining; the warp is very fine and prominent, the woof coarser and hidden underneath: on which depends its gloss and beauty. Some satins are quite plain, others wrought, some flowered with gold or silk, others striped. The finest satins are those of Florence and Genoa, yet the French will not allow those of Lyons to be at all inferior. Indian satins, or satins of China, are silken stuffs, much like those manufactured in Europe. Of these some are plain, others worked, either with gold or silk, flowered, damasked, striped, &c. They are mostly valued because of their bleaching easily, without losing any thing of their lustre. In other respects they are inferior to those of Europe. Some very good satins are made in England.

VELVET; a rich kind of thick, shaggy stuff made of *silk;* the nap, or velveting, of this stuff is formed of part of the threads of the warp, which the workman puts on a long narrow-channelled ruler, and which he afterwards cuts by drawing a sharp steel tool along the ruler to the end of the warp. The principal and best manufactures of velvet are in England and France; there are others in Italy, as at Venice, Milan, Florence, Genoa, and Lucca, and in Holland at Haerlem; those in China are the worst of all. A good imitation of silk velvet is now to be obtained, made of cotton; but the dyes are less permanent on cotton than on silk.

TAFFETY; a kind of fine, smooth, silken stuff, having usually a remarkable gloss. There are taffeties of all colours, some plain, others striped with gold, silver, silk, &c. others chequered or flowered. There are three things that contribute to the perfection of taffeties, the silk, the water, and the fire. The silk should not only be of the finest kind, but must be worked a long time and very much before it is used. The watering seems only intended to give it that fine lustre, by a peculiar property not found in all waters; and lastly, the perfection of the stuff depends greatly on the particular application of the fire.

GAUZE, a transparent kind of stuff, which is woven sometimes of silk, and at other times only of flax. There are figured gauzes, some with flowers of gold and silver, on a silk ground; these last are chiefly brought from China. The gauze loom is much like that of a common weaver, though it has several appendages peculiar to itself.

TABBY; in commerce a kind of coarse taffety, watered. It is manufactured like the common taffety, excepting that it is stronger and thicker both in the woof and warp. The watering is given to it by means of a calendar; the rollers are of iron or copper variously engraven, which, bearing unequally on the stuff, render the surface thereof unequal, so as to reflect the rays of light differently. It is usual to tabby mohairs, ribbons, &c. Tabbying is performed without the addition of any water or dye, and furnishes the modern philosophers with a strong proof, that colours are only appearances.

BROCADE, in commerce, a sort of stuff made of cloth, of gold, silver, or silk, raised and enriched with flowers, foliage, or other figures, according to the fancy of the manufacturer. Formerly the term was applied only to cloths woven either wholly of gold both

woof and warp, or of silver, or both together; but by degrees it came likewise to pass for such as had silk intermixed, to fill up and terminate the flowers of gold and silver. At present any stuff or silk, satin, or even simple tapestry, when wrought and enriched with raised flowers, &c., obtains the appellation of brocade.

Numerous other articles made of silk, or of silk and some other materials, such as *ribbons*, which form so ornamental a part of the ladies' dresses, *Sarsenets*, *Persians*, *Modes*, *Armozines*, *Florentines*, *Bombazines*, *Crapes*, &c. would seem to require some notice, but our limits preclude the possibility of enlarging on these various manufactures.

STOCKINGS. Anciently the only stockings in use were made of cloth, or milled stuffs sewed together: but since the invention of knitting and weaving stockings of silk, wool, and cotton thread, the use of cloth stockings is laid aside. The modern stockings, whether woven or knit, are a kind of plexus, formed of an infinite number of little knots, called stitches, loops, or meshes, intermixed. *Knit stockings* are wrought with needles made with polished iron, or brass wire, which interweave the threads, and form the meshes of which the stocking consists. This operation is called knitting, the invention of which it is difficult to fix precisely, though it is commonly attributed to the Scots, because the first works of this kind came from Scotland. It is added, that on this account the company of stocking-knitters established at Paris, in 1527, took for their patron St. Fiacre, who is said to have been the son of a king of Scotland. *Woven stockings* are manufactured on a frame or machine made of iron, the structure of which is exceedingly ingenious, yet complex. On this account it is not easily described. The English and French have contested the honour of inventing the stocking-frame. It is said that a Frenchman first invented this useful machine; but, finding some difficulties in carrying his plan into execution at Paris, he came over to England, where his machine was admired, and he rewarded according to his merit. The invention thus imparted to the English, they became so jealous of it, that for a long time it was forbidden, under pain of death, to carry any of the machines out of the island, or communicate a model thereof to foreigners. It is, however, with more truth asserted, that the inventor was an Englishman of the name of Lee, in 1589; and that the only pretensions which the French have to the merit of this discovery, are, that a Frenchman, having learned the construction, carried his knowledge to France, and made a loom at Paris.

Knit stockings are the strongest and the most lasting wear, while *woven* stockings are, unquestionably, the neatest; the last have, however, almost entirely superseded the former as an article of dress in this country. Nottingham and Leicester are the chief markets for woven stockings.

COTTON,

A soft downy substance, enveloping the seeds of the *gossipium* or cotton plant, of which there are many species, all of them natives of warm climates, and almost all of them annual plants. The *Herbaceum*, a native of the East Indies, is the species usually selected for propagation. The plant is about the size of a currant bush, and although a native of the torrid zone, yet is produced in Turkey. The pods

are usually about the size of large gooseberries, though sometimes as large as small apples. These are closely filled with the cotton surrounding the seed. When these plants are raised in this country, they must be continually kept in a warm stove, where they will produce seeds and cotton. They are propagated by seeds, which are sown in March or April. The generality of cotton is white, but some is of a *nankin* colour, and is invaluable in the manufacture of that article, as it fades very little, even with long use, and frequent washing. Cotton comes from the Levant, the West Indies, America, and the East Indies.

It should be stated, that the cotton plant, though naturally an annual, may, by repeated cropping, be made to bear a sufficiency of fruit for three years successively.

Carding of cotton, as a preparation for spinning, was formerly performed by the hand, with a single pair of cards, upon the knee; but this being a tedious process, other methods were contrived by a Mr. Hargrave, of applying two or three cards to the same board, and fixing them to a stool or stock. *Cylindrical cards* were afterwards invented, and are now most commonly used.

Spinning of cotton. The most simple and only method was formerly by the hand upon the one-thread wheel; but about 1767, Mr. Hargrave invented a machine called a jenny, for spinning twenty or thirty threads at once, and it is now commonly constructed for eighty-four threads. But the next and greatest improvement was made by Mr., afterward Sir Richard Arkwright. The machinery by which cotton in this country is carded, roved, and spun, is not equalled in any part of the world. To these improvements Great Britain is entirely indebted for the extent of its cotton manufactures, which are now upon an immense scale. Besides our domestic consumption, it appears from official documents that the value of *British* cotton goods exported from Great Britain to foreign parts has exceeded, on an average of many years past, the sum of *twenty millions sterling* annually; and that the exportation of *cotton twist* and *yarn* is now upwards of the value of *three millions sterling* annually.

Of the numerous cloths made of *cotton*, it is not possible for us to give even a catalogue of the names: besides those below, of which we have given a specific notice, we may mention *Dimity*, a curious and useful manufacture for bed-furniture and other purposes; *Check* for aprons of the housewife, and sailors' shirts; *Sheeting* for beds, &c. Of cotton as *thread* for sewing it may be observed, that such is the perfection of its manufacture, it has, in numerous instances, wholly superseded that from flax.

Cotton of Siam is a kind of silky cotton in the West Indies, so called because the seed was brought from Siam. It is of an extraordinary fineness, even surpassing silk in softness: they make hose of it there preferable to silken ones for their lustre and beauty. They sell at ten, twelve, or fifteen crowns a pair, but there are very few made unless for curiosity.

Formerly cotton grew chiefly in Egypt, and was used by the priests and sacrificers for a singular kind of gowns, worn by them only. Spun cotton furnishes various cloths, muslins, calicoes, dimities, and hangings, and is frequently joined with silk and flax in the composition of other stuffs.

MUSLIN, a fine sort of cotton cloth, so called as not being bare,

but having a downy nap on its surface resembling moss, which the French call *mousse*. Muslin is of many sorts and qualities. *Cambric muslin* is in very general use for gentlemen's neck cloths and other purposes; the ladies are also well acquainted with *Book*, *Jaconot*, and many other varieties of this luxurious article. Muslins are sometimes printed, and are then denominated *chintz*. Some muslins are still, we believe, brought from the East Indies, chiefly from Bengal; but much is manufactured both in England and Scotland.

CALICO is a cloth resembling linen, but made of cotton. It was first brought to England in 1631; it was first manufactured in this country about the year 1772. The name is taken from that of Calicut, a city on the coast of Malabar, it being the first place at which the Portuguese landed, when they discovered the Indian Peninsula. Calicoes are plain, shirting, printed, dyed, stained, &c.; all of which are included under the general denomination of calicoes. The printing of calicoes commenced in London about the year 1676. At the present time *London prints*, as they are called, are in most esteem; but Manchester and Paisley are also noted for the manufacture of printed calicoes.

FUSTIAN is a kind of thick cotton stuff, which appears as if it were crossed on one side. Real fustians should be made altogether of cotton thread, both woof and warp: there are fustians of divers kinds and qualities, both with and without ribs. There are also many, whereof the warp is flax, or even hemp. Fustian is sometimes white; but it is more commonly some shade of olive or drab.

FLAX,

Or *Linum usitatissimum*, is an annual plant, with a slender, hollow stem, usually about two feet high, the bark of which consists of fibres, which, dressed and worked, make that desirable commodity, *linen-cloth*, of a variety of qualities and names; and also *thread*, for the purposes of sewing. Flax thrives best in a moderately dry, deep, loose soil, that has long lain fallow. Flax pulled up in the bloom proves whiter and stronger than if left standing till the seed is ripe; but then the seed is lost. The preparations flax must undergo, to fit it for spinning are pulling, steeping, drying, swingling or beating, and hackling. *Flax-seed*, or *lintseed*, has several valuable qualities. It is employed in medicine, in which also its expressed oil is occasionally used, but this last most frequently in painting, &c.; see pages 80 and 88.

CAMBRIC is a species of linen made of flax, very fine and white, the name of which was originally derived from the city of Cambray, where it was first manufactured. It is now made at other places in France, as well as in different parts of England, Scotland, and Ireland; but French cambrics are still preferred for their extreme fineness and durability: they were formerly prohibited under severe penalties, but may now be imported on the payment of a certain duty, and on certain other conditions.

LACE, an open work composed of many threads of linen, cotton, or silk, interwoven and worked upon a pillow with bobbins, according to any pattern designed. The open part is formed with pins, which are placed and displaced, as the bobbins are moved. This is called *bone-lace*. There are several towns in England, and particularly in Buck-

inghamshire, that carry on this manufacture; but vast quantities of the finest laces have been imported from Flanders. The best *white* lace has been usually made of flax; but *cotton* can now be spun so neatly and finely, that the use of it, even in *bone-lace*, has completely, in England, superseded the use of flax: and indeed *woven-lace* is now got up in this country so neatly as to have also superseded, in a great degree, the use of that made by the hand. *Gold* and *silver* thread is also wrought into *lace*. This is a stout fabric, commonly close, but wrought so as to exhibit some sort of figure. It is made of different widths, but all narrow, like ribbon. There is also a *worsted lace*, of a similar texture, commonly wrought with various patterns in colours. This was formerly much used on liveries, and may still be seen occasionally on the lining of carriages.

HEMP, or *Cannabis sativa*, is an annual plant of great use in the arts and manufactures, furnishing thread, cloth, and cordage. Hemp bears a near analogy to flax, not only in form, but also in culture and use. The bark of the stalk, as in flax, is the chief object for which it is cultivated. Sandy and low rich soils suit it best. Hemp is of two kinds, male and female. It is the female alone that produces seed. Hemp is reared in this country in considerable quantity; but it is also imported from Russia, where also various strong cloths are made from it. Here it is chiefly used for coarse bags and cordage of all kinds.

CANVAS is made of hemp woven regularly in a kind of small squares, and used for working tapestry with the needle, by passing threads of gold, silver, silk, wool, &c. through the intervals or squares. *Canvas* is also a coarse hempen cloth, used for ships' sails. It is also a term applied to a stout coarse cloth made in Germany brought into this country, and worn here by the peasantry; the importers call it *Ticklenburgh*. The name is also used by painters for the cloth extended over a frame on which they draw their pictures. The canvas is smoothed, then sized, and afterward whitened over. This makes what the painters call their *primed cloth*, on which they draw their first sketches with coal or chalk, and afterwards finish with colours.

Many other cloths might also be described, such as *Russia Duck*, *Russia Towelling*, or *Hempen Russia;* and of our own manufactures, *Tick* for beds; *Dowlas*, a strong linen formerly much worn, but now almost superseded by calico; and *Irish linen*, called by the vulgar *holland*; one of the staple manufactures of Ireland, which employs so large a portion of the population, and is unquestionably one of the neatest and most useful articles produced in the United Kingdom; but we must reluctantly quit this section of our work.

Skins, Leather, Parchment.

The word skin is particularly applied to the exterior membrane taken off an animal, to be prepared by the tanner, skinner, currier, parchment maker, &c., and converted into leather or parchment. See Part I. page 4.

TANNING is the process of converting the skins of animals into *Leather*.

It is difficult to determine when the art of tanning was first practised; but that it was known at a very early period, there is little doubt. The real change, however, which skins undergo by being tanned has not been accurately known till of late years. It is now indubitably

ascertained that a mixture of *gelatine* and *tannin*, of which we shall presently speak, although each is separately soluble in water, becomes insoluble in that fluid, and forms the substance so well known as *leather;* hence, as the chief constituent of all animal skins is gelatine, the ease with which, by immersion in a solution of tannin, they are converted into that useful substance. The processes of tanning are nevertheless numerous, and somewhat complicated and tedious. The skins are in general, after being freed from their horns, ears and blood, and other impurities, placed in lime-pits for a longer or shorter period, in order to their hair and scarf-skins being more readily removed; after which they are immersed in a pit containing water and sulphuric acid. This operation is called *raising*, which disposes the skin more readily to combine with the tannin. It is next placed in the tan-pit, with a layer of oak-bark ground fine between each skin; the pit is then filled with tanning ooze prepared from oak-bark and water, where the skins remain a month or six weeks, when they are taken out, a fresh quantity of bark and ooze is put in as before, and the process is thus continued till the skins are completely tanned; and they will become so in a shorter or longer time, depending upon the thickness of the skin and the manner in which the application of the tannin has been made. When sufficiently tanned they are taken out, and after undergoing certain manipulations, are dried, weighed, and stamped in this country by the excise officer. The time required for the processes of tanning varies exceedingly; the larger skins require from six to fifteen months to be effectually tanned. The processes are also varied for different skins; but we cannot detail them. The largest skins are denominated *hides*, and the leather *Butt leather;* another kind, not so thick, are called *Crop hides:* they form also a kind of butt leather; both are used for the soles of shoes and other purposes in which stout leather is essential.

The skins of calves, seals, &c. are tanned in a similar manner: they of course take less time; and as they are much thinner, they are used for the upper leather of shoes, boots, &c.

Various methods have been attempted to shorten the duration of the period hitherto found necessary for converting skins into leather, and various patents have been also obtained for the purpose; among the rest, one of the ingenious Mr. Perkins, by *pressure*, so that, it is said, leather can be tanned almost *at once*, as completely as by the ordinary way in months. Of the real merits of this process we cannot, however, speak decidedly. Sir Humphry Davy also suggested, some time since, a method of expediting the process; which consisted in placing the skins vertically instead of horizontally in the tan-pits; whether this process be now practised in any of our tan-yards, we do not happen to know. And after all, it is very questionable whether the *expeditious* methods of tanning here alluded to, be desirable, as, from the most attentive observation, the *slow* processes of tanning make the best leather, chiefly, it is said, because the skins imbibe, besides tannin, a larger quantity of *extractive matter* than they can do by those performed in an expeditious way; and which is supposed to contribute materially to the goodness of the leather.

We may just mention that raw skins may be preserved for tanning by being *salted.* Seals' skins are thus imported.

TANNIN, to which we have adverted in the preceding article, exists in large quantity in various vegetable substances: it is found par-

ticularly in abundance in the bark of oak, Spanish chestnut, willow, elm, ash, &c. In this country, however, leather is tanned chiefly by the use of the bark of the oak, which is ground in a mill by tanners for the purpose. Mr. HATCHETT has shewn that artificial tannin may be formed by digesting charcoal in dilute nitric acid during several days, by which a reddish brown liquor is obtained, and being evaporated, produces a brown glossy substance, differing only from natural tannin in resisting the action of nitric acid, by which all natural tannin is decomposed.

For some years past large quantities of oak-bark have been imported from the continent, to supply the deficiency of our own produce; and attempts have been also made to supply the use of bark itself by an importation of *tannin* in a more portable shape. *Catechu*, or Japan earth, containing a large proportion of tannin, has been recommended to the attention of the tanners; see page 84. And Mr. KENT brought from New South Wales a large quantity of an *extract* from the bark of the *Mimosa*, a tree growing plentifully in that country, the bark of which is used at Sydney and other places as a material for tanning. Mr. Kent states that extract of mimosa bark will produce as much leather as five times its weight of oak bark; and from its comparative cheapness, recommends it to the attention of tanners. See Vol. XLI. of the *Transactions of the Society of Arts*.

CURRYING is the last process to which tanned skins are subjected; it is applied to those destined for the upper leather, legs of boots, seats of saddles, and such purposes as do not require either great strength or impermeability by water, and never to sole leather. Currying leather consists in shaving or scraping the flesh side of the tanned skin with a straight edged two handled knife, against a wooden bench or stock, and thus reducing the tanned skin to a uniform and determined thickness, according to the purpose for which it is designed. After being thus shaved (if designed for common shoes and boots,) it is rubbed with train oil and rendered soft and flexible, while the shaved side of the leather has assumed a shining fibrous appearance. In this state the flesh side is waxed or blackened with a mixture of oil and lamp-black. But where the leather is not oiled in dressing, the hair side of the skin, if it be required to be black, after being duly scoured clean with a pumice-stone, is dyed with a solution of sulphate of iron in water, or some other dye.

PARCHMENT is the skins of sheep or goats, prepared after such a manner as to render them proper for writing upon, covering books, &c. When parchment was first used as a material for the reception of writing, is not exactly determined. It is however tolerably certain, that it was used long before the Christian æra; and it is said that the name *parchment*, or *charta pergamena*, is derived from *Pergamus*, a city of Asia Minor, where it was invented in consequence of Ptolemy having forbidden the exportation of the *papyrus* from Egypt. Before the invention of *paper*, parchment necessarily formed a considerable article of commerce, as, for many centuries, most of the books of Europe were written on it. Its use is now confined chiefly to legal instruments and the covers of books.

The *manufacture of parchment* is begun by the skinner, and finished by the parchment maker. The skin, having been stripped of its wool, and passed the lime-pit, is stretched on a frame, perforated lengthwise, with holes furnished with wooden pins, which may be

turned at pleasure, like those of a violin. When sufficiently stretched, the flesh is pared off with a keen-edged instrument; the skin is then moistened with a white rag, and a kind of white stone or chalk, reduced to fine dust, being strewed over it with a large pumice-stone, flat at bottom, similar to a muller for grinding colours, the remainder of the flesh is scoured off. It is then gone over again with the iron instrument, moistened as before, and rubbed with the pumice-stone without any chalk underneath. The flesh-side being thus treated, the iron is passed over the wool or hair-side; the skin is then stretched again tight on the frame by means of the pins, and the flesh-side is again gone over with the iron. More chalk is now thrown on, and the skin is swept over with a piece of lamb-skin that has the wool on; this smooths it still further, and gives it a white down or nap. It is now left to dry, and when dried, taken off the frame, by cutting it all round. The skin, thus far prepared by the skinner, is taken out of his hands by the parchment-maker, who first scrapes or pares it dry on the *summer*, a calf-skin well stretched on a frame, serving as a support to the skin, which is fastened over it with a wooden implement that has a notch cut in it, with an iron instrument like that above mentioned, only finer and sharper; with this, worked with the arm from the top to the bottom of the skin, he takes away about one half of its thickness. The skin being thus equally pared on both sides, the pumice-stone is passed over each side, to smooth it. This last process is performed on a kind of form or bench, covered with a sack stuffed with flocks, and leaves the parchment in a condition for writing on. The parings taken off the leather are used in making glue, size, &c. As there is a great waste in reducing the skins to a proper thinness in this mode, an instrument has lately been invented for splitting each skin into two.

Virgin parchment is made from the skins of the abortions of a sheep or goat. It is used for fans, &c., being a finer and thinner sort than common parchment.

VELLUM is parchment, somewhat finer, more even, and whiter than the common sort. The word is formed from the French *velin*, of the Latin *velamen*, a skin, or *vitulinus*, belonging to a calf. Chambers observes, that what we call *vellum* is only parchment made of the skins of abortive calves, or at least of sucking calves; it is finer, whiter, and smoother than the common parchment, but is prepared in the same manner, excepting that it is not passed through the lime-pit.

SHAMMY, a kind of spongy leather, much esteemed for its softness and pliancy. Its name is derived from the *chamois*, a wild animal of the antelope genus, which inhabits the mountains of Dauphine, Savoy, Piedmont, and the Pyrenees; and, no doubt, leather prepared from the skins of this animal is useful and valuable; but the shammy leather in general use is made from the skins of sheep or the doe, and finished with oil, so that it is supple and bears washing. Such is that with which most breeches, many gloves, &c. are made.

SHAGREEN, a kind of very hard, grained leather, brought from Turkey, Poland, Algiers, &c.; it is used as covers for cases, books, &c. It is made thus:—The skin, having undergone the necessary preparations, is covered while wet with a layer of small, round seeds, which are pressed down upon it by weights. In this state it is suffered to dry, and then the rising parts are shaved off, till the surface is

quite smooth. Being wetted, the parts depressed by the seeds swell up, and appear like so many tubercles, which retain their figure after the skin is again dried. The best is of a brownish colour. It is extremely hard; yet, when steeped in water, becomes very soft and pliable, whence it becomes of great use among case-makers. It takes any colour that is given to it; red, green, black, yellow. The skin of some of the species of shark or dog-fish, being very rough, was formerly sold as shagreen; but its prominences have not the roundness of those of shagreen, and it has long been known by its proper name of *fish-skin*. The skins of which shagreen is made are not exactly known in this country.

MOROCCO is the skin of a goat, or some other animal resembling it, called *menon*, common in the Levant; dressed with sumach, or galls, and coloured with any colour, much used in upholstery, bookbinding, for ladies' shoes, &c. But most of the morocco to be obtained in this country, is prepared here from sheep skins. The name is derived from the kingdom of Morocco, whence it is supposed the manner of preparing this leather was first borrowed. Morocco is however brought from the Levant, Barbary, Spain, Flanders, and Russia: red, black, yellow, blue, &c.; the methods of preparing which are too long to be detailed here. The process has been latterly greatly simplified, and the brilliancy and durability of the Turkey red successfully imitated. The abundance and excellence of the Spanish goat skins enabled the Spaniards to take the lead in this manufacture; the Russians followed them; but Morocco of various colours is now prepared in England equal to any imported.

ERMINE, in heraldry, signifies black spots on a white field, but if the word *plain* be used with it, denotes nothing but white fur. It is supposed to represent the skin of an animal of the same name: but there is no animal whose skin naturally corresponds to the herald's ermine. The real *ermine*, *mustela ermina*, is milk white, with a tail black at the tip. But white skins having for many ages been used for the robes of magistrates and great men, the furriers, at length, to add to their beauty, sewed a few bits of black upon the white, to render them more conspicuous. The ermine inhabits cold countries, lives in heaps of stones, banks of rivers, hollow beech trees, and preys on squirrels, mice, and small animals. Its body is about ten inches long, hair short, and very white in northern climes.

GLUE, or GELATIN, is a viscid, tenacious matter, soluble in water, and used in the arts as a cement to bind or connect things together. There are many kinds of glues; as common glue, glove glue, parchment glue. Common glue is used by joiners, cabinet-makers, case-makers, hatters, book-binders, &c. The consumption of it is very considerable. The best glue is made in England, in square pieces, of a ruddy brown colour. Flanders glue is esteemed next to the English. Glue is made of the skins of all kinds of beasts, as oxen, cows, calves, sheep, &c. The older the beast is, the better the glue that is made of its hide. Indeed, it is rare that whole skins are used for this purpose, they being too valuable; but shavings, parings, or scraps of skins, and sometimes the feet, sinews, &c. of beasts are used. Glue made entirely of skins is the best; and that of sinews, &c. the worst: and hence chiefly arises the difference of glues.

To make glue of parings.—They first steep them two or three days in water, then, washing them well, boil them to the consistence of

a thick jelly. This done, they pass the jelly, while yet hot, through osier baskets, to separate it from any impurities; and in order to purify it still further, they let it rest some time. When the impure matter is precipitated to the bottom of the vessel, it is dissolved and boiled down a second time. It is then poured into flat frames, or moulds, whence it is taken out when rather hard and solid, and cut into square pieces, or cakes. Nothing now remains, but to dry it in the air, on a sort of coarse net, and afterward to string it, to finish the drying. The glue made of feet, sinews, &c. is managed after the same manner, with this difference only, that they bone and scour the feet, and do not lay them to steep. The surest test of the goodness of glue, besides its clearness and hardness, is, when it dissolves completely in water, without leaving the least sediment. All the glues, when pure, are very nutricious as food.

Size is less adhesive than glue, and is obtained from parchment shavings, fish-skins, and several animal membranes. It is employed by book-binders, paper-hangers, &c.

Fish-glue is a sort of glue made of the gelatinous parts of fish. It is of considerable use in refining liqours, in pastry, and various other arts; it is better known by the name of ISINGLASS, under which it is described, p. 92.

WHALEBONE grows in the mouth of the *Balæna mysticetus* or common whale, and is chiefly found attached to the upper jaw, and terminating in a fringy substance similar to horse-hair. It readily splits into laminæ; but it is said that cutting the whalebone out of the mouth is a particular art, requiring many iron tools for the purpose. It is found in the whale, of various lengths: but what is brought to this country is from three or four to fifteen feet long. It appears to be of similar nature with horn. Whalebone is used for ladies' stays, fans, busks, screens, and many other purposes, where elasticity is necessary. Of late years, bristles having become scarce, whalebone has been split into slender fibres, and used for making brushes. It has also been reduced to thin slips, rendered beautifully white and glossy, plaited in the manner of straw, and thus formed into elegant ladies' hats.

HORN is a hard substance growing on the head of divers animals. Horns make a considerable article in the arts and manufactures; bullocks' horns, softened by the fire, serve to make lanterns, combs, inkhorns, tobacco-boxes, and numerous other articles. The horn and hoof consists principally of albumen. Hartshorn appears to be an intermediate substance between the horns of oxen, sheep, and goats, and ivory, as both hartshorn and ivory contain a considerable portion of gelatine, and are less elastic than common horn.

TORTOISE-SHELL is the horny cover of the tortoise described at p. 65. This substance, being finely shaded with yellow brown, is used for combs, snuff-boxes, knife-handles, and other ornaments. It was esteemed a great luxury among the Romans for their decorations.

IVORY is the tooth or tusk of the elephant, growing on each side of the trunk, somewhat in the form of a horn. It is much esteemed for its colour, the fineness of its grain, and polish. The ivory of Ceylon and Achem never becomes yellow, like that of Terra Firma and the East Indies. Ivory is prepared as a ground for miniature painting, by rubbing it over with juice of garlic: this takes off the greasiness, which would otherwise prevent the paint from fixing. Ivory shavings, like those of hartshorn, boiled in water, yield a nutricious jelly.

BONE. The nature of bones has already been described, page 3; their uses are numerous:—in making iron malleable; for absorbing the sulphur of sulphureous ore; for forming tests and cupels, or vessels for refining gold or silver with lead, as burnt bones compose a mass of a porous texture, which absorbs vitrified lead and other metals; for making sal ammoniac or volatile salt, and empyreumatic oils; for making ivory black; and also for making glue and jelly, much of what are called hartshorn shavings being those of common bones, of which those of the calf are the best for this purpose. The bones of the cuttle-fish are used by goldsmiths for making moulds. Bones are also used in lieu of ivory, for toys and cutlers' work. To describe the numerous smaller articles into which bone and ivory are wrought, would be tedious. The toy-shops and other places exhibit a considerable variety: and while the less curious inspector will view such trifles only as to their exterior appearance or prettiness, the inquisitive mind will discern in them much art, industry and ingenuity. *Ground bones* have been also recommended in agriculture as a useful manure.

Hats and Felting.

HATS are chiefly made of hair, wool, &c., worked, fulled, and fashioned to the required figure. Hats are said to have been first worn in Europe about the year 1400. When Charles IV. made his public entry into Rouen in 1449, he had on a hat lined with red velvet, and surmounted with a plume of feathers. From this entry, at least under this reign, the use of hats and caps in France superseded the use of chaperons and hoods. In progress of time, from the laity, the clergy likewise took the habit; but it was looked on as a great abuse, and several regulations were published, forbidding any religious person, to appear abroad in a hat without cornets, and enjoining them to keep to the use of chaperons, made of black cloth, with decent cornets; if they were poor, they were at least to have cornets fastened to their hats, on the penalty of suspension and excommunication. Indeed the use of hats is said to have been of a longer standing among the ecclesiastics of Brittany by two hundred years; but these were a kind of caps: whence arose the square caps worn in colleges, &c. Hats make a very considerable article of commerce. The finest, and those most valued, are made of the fur of the beaver: see page 94. They are also made either of the wool or hair of other animals, as the hare, rabbit, camel, goat, lamb, sheep, seal, mole, and of cotton, &c.

The process is much the same in all; and we shall therefore give that with beaver. The skin of this animal is covered with two kinds of hair: the one, long, stiff, and glossy; the other, short, thick, and soft, which alone is used in hats. When the hair is cut off, the whole is carded with cards, like those used in the woollen manufacture, only finer. The stuff is now laid on the hurdle, which is a square table, having longitudinal chinks cut through it; on this hurdle, with an instrument called a bow, much resembling that of a violin, but larger, the string of which is worked with a little bow-stick, and thus made to play on the hair or wool, it is mixed together, the dust and filth at the same time passing through the chinks. This is considered one of the most difficult operations of hat-making, as upon the proper

bowing and admixture of the fur depends greatly the goodness of the hat. The quantity bowed at once is called a *batt*, and never exceeds half of that which is required to make one hat. With this they form gores, or two capades, of an oval shape. They are designedly made thicker in the brim, near the crown, than towards the circumference, or in the crown itself.

The capades or batts being finished, they are reduced into closer and more consistent flakes, by pressing them down with a hardening skin, or leather. This done, they are carried to the basin, a sort of bench with an iron plate fitted therein, having a small fire underneath it; upon which, laying one of the hardened capades, sprinkled over with water, and a sort of mould applied thereon, the heat of the fire, with the water and pressing, embody the wool into a slight hairy sort of stuff or felt; after which, turning up the edges all round over the mould, they lay it by, and thus proceed with the other. This finished, the two are next joined together, so as to meet in an angle at the top, forming one conical cap. The hat thus basined, is removed to a large trough, resembling a mill-hopper, sloping from the edge to the bottom, which is a kettle, filled with water and grounds of beer, or water rendered sour by sulphuric acid, and kept hot for the purpose. On the sloping side, called the plank, the basined hat, being first dipped in the kettle, is laid. Here it is worked, by rolling and unrolling it again and again, first with the hand, and then with a little wooden roller, taking care to dip it from time to time; till at length, by thus felting or thickening it for four or five hours, it is reduced to the extent or dimensions of the hat intended.

After being thus wrought, the proper form is given to it, by laying the conical cap on a wooden block, of the intended size of the crown of the hat, and thus tying it round with a pack-thread, called a commander; after which, with a piece of iron, or copper, bent for the purpose, and called a stamper, they gradually beat or drive the commander all around, till it has reached the bottom of the block, and thus the crown is formed; what remains at bottom below the string being the brim. The hat being now set to dry, they proceed to singe it, by holding it over a flare of straw, or the like; then it is pounced, or rubbed with pumice stone, to take off the coarser nap; then rubbed over afresh with seal skin, to lay the nap still finer; and lastly, carded with a fine card, to raise the fine down, with which the hat is afterward to appear. It is then sent upon its block, tied about with packthread as before, to be dyed.

The dyer's copper is usually very large, holding ten or twelve dozen hats. The dye, or tincture, is made of logwood, verdigris, sulphate of iron, and alder bark, to which some add galls, sumach, &c. After the hat has been boiled in the colouring liquor about three quarters of an hour, it is taken out and set to cool, and then returned to the dye; and this for ten or twelve times successfully. The hat being dyed, is returned to the hatter, who proceeds to dry it, by hanging it up in a suitable stove or oven. When dry it is stiffened with a solution of glue, or gum-senegal. It is next steamed on the steaming basin, a little fire-place, raised three feet high, with an iron plate laid over it, exactly covering it. On this plate they first spread cloths, which being sprinkled over with water to secure the hat from burning, the hat is placed, brim downwards, thereon. When moderately hot, the workman strikes gently on the brim, with the flat of his hand, to

make the jointings incorporate and bind, so as not to appear; turning it from time to time, and at last setting it on the crown. When steamed sufficiently and dried, it is again put on the block, and brushed and ironed on a table called the stall-board. This is done with irons like those commonly used in ironing linen, and heated like them; which being rubbed over each part of the hat, with the assistance of the brush, smoothens and gives it a gloss, which is the last operation.

Hats are distinguished in trade either as *stuff-hats*, those which consist chiefly, if not wholly, of beaver and other fine fur; *plate-hats*, which consist of wool covered with a better material on the outside only; or, *cordies*, made wholly of wool, or other coarse material. *Silk-hats* are also now worn; they are formed of a stout oil case or some such material, and merely covered with silk; these hats are waterproof.

Several substitutes for beaver, and rabbit-down, which are now used for the outsides only of hats, have lately been introduced with more or less effect, as mole-fur, silk, cat's hair, &c. A very elegant kind of summer hat is made of feathers; and light hats, for the same season, have been made of plaited straw and of chip.

FURS are the skins of several kinds of wild beasts, dressed with the hair on, and used as a lining or trimming of garments, either for warmth or ornament. The kinds of furs, or skins, chiefly dressed in alum, and with the hair on, are those of the ermine, sable, martin, squirrel, castor, otter, dog, fox, hare, rabbit, wolf, tiger, bear, &c.

A BUTTON is an article of dress serving to fasten clothes on the body, and made in various forms of silk, mohair, thread, metal, horn, bone, mother of pearl, wood, &c. METAL buttons, which are now the most common, are formed in two ways, and are either solid metal, or consist of thin plates or caps, bottomed with bone or wood. Metal buttons, properly so called, are either white or yellow, gilded or plated, and consist of solid metal, generally copper, with more or less alloy of zinc. The tops of such buttons are either cut out of sheet metal, or cast; in the latter case the shanks or eyes are fixed exactly in the centre of each mould, so as to have their extremities immersed in the melted metal, by which means they are firmly fixed in the button when cooled. The former method is used for yellow buttons, the latter for those of white metal. The shanks or eyes of the former kind are made with great expedition; by a curious engine, they are attached to the bottom of each button by a wire clamp, like a pair of sugar tongs; solder is applied, and they become fixed to the button after exposure on a hot iron. The button is then burnished for plaiting or gilding; the latter is effected by covering the surface with a thin coat of mercury, over which is laid an amalgam of mercury and gold, and the mercury evaporated by heat. Five grains of gold will thus cover 144 buttons one inch in diameter. Plating or silvering may be performed nearly in the same manner, or with muriate of silver.

Wrought or *figured* buttons are made of mohair, or silk, and a very inferior kind of thread. In order to make a button, the mohair must be previously wound upon a bobbin, and the mould fixed upon a board, by means of a bodkin thrust through the hole in the middle of it. This being done, the workman wraps the mould in three, four, or six columns, according to the button. The moulds of *horse-hair buttons* are covered with a kind of stuff, composed of silk and hair; the warp being belladine silk, and the shoot horse-hair.

Gold twist buttons are first covered in the same manner as common buttons. Then the whole is covered with a thin plate of gold or silver. It is afterwards wrought all over with purl, a kind of thread composed of silk and gold wire twisted together, and gold gimp.

Glass buttons of different colours are made when the glass is in a state of fusion, the button being nipped out of it by a pair of iron moulds, like those for casting pistol-shot; the shank having been inserted in the mould, so that it may be found imbedded in the glass when cool.

Mother of pearl buttons are a somewhat ingenious manufacture. The mode of fixing the eye or shank is by drilling a hole at the back, which is under cut; that is, larger at the bottom than the top, like a mortise, and the shank being driven in by a steady stroke, its extremity expands on striking the bottom of the hole, and thus becomes firmly riveted into the button. Steel studs are thus often riveted into buttons of this and other kinds. In cases where stones and foil are used, the shanks are usually attached with isinglass glue. It may be proper to add, that, notwithstanding the present general fashion of wearing buttons, consisting merely of a mould covered with the same kind of cloth as the garment itself, it is prohibited by several acts of parliament, under a penalty of 40*s*. a dozen for either making or wearing such buttons; and several convictions have taken place in order to protect the button manufacturers.

Gold Ores and Manufactures.

GOLD. The nature of gold has been already described as a metal. The method of refining it, and its application to manufactures, are now to be considered. In separating the gold, the mineral ore is first broken with iron mallets, then ground in mills to a fine powder, and passed through several sieves. The powder is then placed in troughs, with mercury and water. After this the water and earth are forced out of the troughs by pouring on a stream of hot water. This done, there remains nothing but the mercury and the ore. The mercury is afterward separated by distillation, and the gold is melted and cast into ingots.

For *refining gold*, either antimony, oxymuriate of mercury, or nitro-muriatic acid, is used. Gold having the property which no other metal has, except platina, of resisting the action of the simple acids, &c. it may be purified by the above agents from all metallic substances, and consequently refined. Another method of purifying gold and silver consists in adding to the alloyed gold and silver a certain quantity of lead, and exposing afterward this mixture to the action of the fire.

Gold wire, as it is called, is most generally made of a cylindrical ingot of silver, superficially gilt, and afterward drawn successively through a great number of the holes of a wire-drawing iron, each less than the other, till it is sometimes no thicker than a hair of the head. Before the wire is reduced to this excessive fineness, it is drawn through above a hundred and forty different holes; previously to each time of drawing, it is rubbed afresh over with new wax, both to facilitate its passage, and prevent the silver appearing through it.

Gold thread, or *spun gold*, is flatted gold, wrapped or laid over a thread of silk, by twisting it with a wheel. To dispose the wire to be spun on silk, it is passed between two rollers of a small mill; the gold wire is thus made quite flat, without losing any thing of its gilding, and is rendered so exceedingly thin and flexible, that it is easily spun on silk thread, by means of a hand-wheel.

Gold leaf is gold beaten with a hammer into exceedingly thin leaves, so that it is computed that an ounce may be beaten into sixteen hundred leaves, each three inches square. That for the gold wire is left much thicker than that for gilding picture frames. The gold is beaten between pieces of skin on a block, commonly of black marble, about a foot square. The hammers are of polished iron. The gold is first formed from the ingot to the thickness of a sheet of paper, then it is cut into pieces about an inch square; they are then beaten thinner, and again cut into several smaller pieces.

GILDING is the art of covering a thing over with gold either in the state of a leaf or liquid. The art of gilding was not unknown to the ancients, though it never arrived at the perfection among them, to which the moderns have carried it. Pliny assures us, that the first gilding seen at Rome was after the destruction of Carthage, under the censorship of Lucius Mummius, when they began to gild the ceilings of their temples and palaces, the Capitol being the first place on which this enrichment was bestowed. But he adds, that luxury advanced on them so hastily, that in a little time you might see all, even private and poor persons, gild the very walls, vaults, &c. of their houses. Modern gilders make use of gold leaves of various thicknesses; but there are some so fine, that a thousand do not weigh above four or five drachms. The thickest are used for gilding on iron, and other metals; and the thinnest on wood.

A colour of gold is given by painting and varnishes, without employing gold, but this is a false kind of gilding. Thus a very fine golden colour is given to brass and silver, by applying upon these metals a gold coloured varnish, which, being transparent, shows all the brilliancy of the metals beneath. Many ornaments of brass are varnished in this manner, which is called GOLD LACQUERING, to distinguish them from those which are really gilt. Silver leaves thus varnished are put upon leather, which is then called *gilt* leather. Among the false gilding may also be reckoned that which is done with thin leaves of copper or brass, called *Dutch leaf*. In this manner are made most kinds of what is called *gilt paper*.

The gold intended for gilding ought, in general, to be beaten into thin leaves, or otherwise divided into very fine parts. As metals cannot adhere well merely by contact to any but other metallic substances, when gold is to be applied to the surface of some non-metallic body, this surface must be previously covered with some gluey and tenacious substance, by which the gold will be made to adhere. Such substances are in general called SIZES, some of which are made of vegetable and animal glues, and others of oily, gluey, and drying matters. Upon them the leaves of gold are applied, and pressed down with a little cotton, or a hare's foot; and when the whole is dry, the work is to be finished, polished, or burnished with a hard instrument, called a *dog's tooth*, to give it lustre.

The method of applying gold upon metals is entirely different. The surface of the metal to be gilt is first to be cleaned; and then leaves

are to be applied to it, which, by means of rubbing with a polished blood-stone, or pumice-stone, are made to adhere perfectly well. In this manner silver leaf is fixed and burnished upon brass in the making of what is called *French plate;* and sometimes also gold-leaf is burnished upon copper and iron. Gold is applied to metals in several other manners. One of these is by previously forming the gold into a paste or amalgam with mercury, with which the surface of the metal to be gilded must be covered; then a sufficient heat is applied to evaporate the mercury; and the gold, which is left on the surface of the copper, is, lastly, burnished with a blood-stone.

Some metals, particularly silver, may be gilt in the following manner: —Let gold be dissolved in nitro-muriatic acid. In this solution pieces of linen are dipped, and burnt to black ashes. These ashes being rubbed on the surface of the silver by means of a wet linen rag, apply the particles of gold which they contain, and which, by this method, adhere very well. The remaining part of the ashes is washed off; and the surface of the silver, which in this state does not seem to be gilt, is burnished with a blood-stone till it acquires a fine colour of gold. This method of gilding is very easy, and consumes a very small quantity of gold. Most gilt ornaments upon fans, snuff-boxes, and other toys of much show and little value, are nothing but silver gilt in this manner. Gold may also be applied to glass, porcelain, and other vitrified matters. After the gold leaf is laid on the glass, &c., the pieces are exposed to a certain degree of heat, and burnished slightly to give them a lustre. A more substantial gilding is fixed upon glass, enamel, and porcelain, by applying to these substances powder of gold mixed with a solution of gum arabic, or with some essential oil, and a small quantity of borax; after which a sufficient heat is applied to soften the glass and the gold, which is then burnished. With this mixture any figures may be drawn. The powders for this purpose may be made,—1. By grinding gold leaf with honey, which is afterwards to be washed away with water. 2. By distilling to dryness a solution of gold in nitro-muriatic acid. 3. By evaporating the mercury from an amalgam of gold, taking care to stir well the mass near the end of the process. 4. By precipitating gold from its solution in nitro-muriatic acid, by applying to it a solution of green vitriol in water, or copper, and perhaps other metallic substances.

SILVERING. Wood, paper, &c. are silvered in the same manner as gilding is performed, using only silver leaf instead of gold. For common purposes, copper or brass may be plated by dissolving silver in nitric acid, neutralizing the acid with alkali, and rubbing the polished surface of the article with this mixture, till it assumes a white silver colour, which will continue for some time, if not exposed to much friction. Dial plates of clocks, barometers, &c., are plated with old silver lace dissolved in nitric acid, and then precipitated with common salt; this precipitate is mixed with carbonate of potash and whiting, until it forms a dry mass, with which the metal to be plated is rubbed. The most permanent plating, however, is performed in the following manner:—Take two thin plates of silver and copper, the former in the proportion of one to twelve of the latter; put a little powdered borax between them, and expose them to a white heat, when the silver will be found firmly united to the copper, after which, it is passed between rollers, till it has acquired the proper thickness for the manufacture intended.

COINING is the art or act of making money. Coining is either performed by the hammer or the mill. The first method is now little used in Europe, although it was the only one known until the year 1553, when a new coining-mill was invented by Anthony Brucher; and first tried in the French king's palace at Paris, for coining counters. In either kind of coining, the pieces of metal are stamped, or struck with a kind of moulds or dies, wherein are engraven the prince's effigies, with the arms, legend, &c.; the manner of preparing and cutting of which see under Engraving. The first operations in coining are mixing and melting the metal: for there are no species of money coined of pure gold or silver, but always with a certain quantity of alloy of copper, or other metals, mixed with them; the reasons are partly the necessity of making those metals harder by some foreign admixture, and partly to defray the expenses of coining. Melting, if the metal be gold, is performed in earthen crucibles; if silver or copper, in iron ones. When the gold or silver is melted, it is poured into moulds for casting into plates or sheets; the method of doing this is exactly the same with that used by the founders in sand.

Coining by the mill. The plates being taken out of the moulds, scraped and brushed, are passed several times through the mill, to flatten them, and bring them to the just thickness of the particular species to be coined; with this difference, however, that the plates of gold are heated again in a furnace, and quenched in water, before they undergo the mill; which softens, and renders them more ductile: whereas those of silver pass the mill just as they are, without any heating; and when afterward they are heated, they are left to cool of themselves, without water. The plates, whether gold, silver, or copper, thus reduced as nearly as possible to their thickness, are cut into round pieces, nearly the size of the intended species; these pieces are adjusted, and brought, by filing or rasping, to the weight of the standard, whereby they are to be regulated; and what remains of the plate between the circles is melted again. The pieces are adjusted in a fine balance; and those which prove too light are separated from those too heavy; the first to be melted again, and the second to be filed down: for the mill, through which the plates are passed, can never be so just, but there will be some inequality. They are then carried to the blanching or whitening house, *i. e.* the place where the gold pieces have their colour given them, and the silver ones are whitened; which is done by heating them in a furnace, and afterwards boiling them successively in two copper vessels, with water, common salt, and tartar. After scouring them well with sand, and washing them with common water, they are dried over a wood fire in a copper sieve. They formerly were next marked with an engine on the edges, to prevent the clipping and paring of the species; but latterly, the edges and faces of the money are struck at once. This marking of the edges is called *milling*. Some of the larger pieces, as crowns, have legends impressed on the edge. A new method of coining has been introduced by Messrs. Bolton and Watt, which is now the only mode used in this country. For this purpose buildings are erected on Tower Hill. The machinery invented by these able mechanics has been long used in the manufacture of copper money. A steam-engine works the screw presses for cutting out the circular pieces of copper, and coins both the edges and faces of the money at the same time, with such superior excellence and cheapness of workmanship, as will

prevent clandestine imitation. By this machinery, four boys are capable of striking 30,000 pieces of money in an hour ; and the machine acts at the same time as a register, and keeps an unerring account of the number of pieces struck. These having now all their marks and impressions, both on the edges and faces, become money ; but have not currency till they have been weighed and examined.

For the coining of Medals the process is the same, in effect, with that of money ; the principal difference consists in this, that money, having but a small relievo, receives its impression at a single stroke ; whereas for medals, the height of their relievo makes it necessary that the stroke be repeated several times. Medallions, and medals of high relievo, from the difficulty of stamping them in the press, are usually first cast or moulded in sand, like other works of that kind, and are only put into the press to perfect them.

PLUMBERY is the art of casting, preparing, and working lead ; and using it in building, &c. The lead used in plumbery is furnished from the lead-works in large ingots, or blocks, called pigs of lead, each weighing generally about 100 pounds. Lead melting very easily, is used for figures of any kind, by running it into moulds of brass, clay, plaster, &c. But the chief articles in plumbery are sheets and pipes of lead. These constitute the basis of the plumber's work in building: the following is the process :—

For casting large sheets of lead. The lead is melted in a large cauldron or furnace ; near the furnace is a table, or mould, whereon the lead is to be cast. Around it runs a frame, consisting of a ledge or border of wood, four or five inches high from the table. The table is covered with fine, moist, smooth sand. At the end of the table nearest to the furnace is adapted a box equal in length to the width of the table ; at the bottom of the box is a horizontal slit to let out the melted metal ; the box moves upon rollers along the edges of the projecting rim of the table, and is set in motion by ropes and pulleys properly attached. The box is made to contain as much lead as will cast the whole sheet at the same time ; and the slit in the bottom is adjusted so as to permit the proper quantity of lead to run out during its progress over the table. The lead is taken out of the cauldron with an iron ladle. Over the table is a strike or rake of wood, which bears and plays on the edges of the frame ; and so placed, as, that between it and the sand, is a space proportionable to the intended thickness of the sheet. The use of this strike is to drive the matter, while yet liquid, to the extremity of the mould, and give the sheet an equal thickness. The sheets thus cast, there remains nothing but to edge them, in order to render them smooth and straight.

This is called *cast lead. Milled lead* is not made by the plumber, but at the lead works ; in the operation of making it, a roller or *flatting-mill* is used, whence its name. Milled lead is a slighter article than cast lead. *Sheet lead* is of different thicknesses, varying in its weight from 5 to 9lbs. in each square foot.

For casting thin sheets of lead. The table or mould here used is of a length and breadth at discretion. Instead of sand, it is covered with a piece of woollen stuff, nailed down at both ends to keep it tight ; and over this is laid a very fine linen cloth. These fine smooth sheets of lead are sometimes used between the joints of large stones in great buildings, &c.

There is a method of *casting pipes without soldering.* See SOLDER,

below. By pouring the metal into brass moulds, of about two feet and a half long, then, by shifting the mould, &c. and repeating the operation, pipes are formed of any length required.

TIN. The mineral ore, being taken from the mine, is broken into pieces with large iron mallets; then brought to a stamping mill, where it is beaten still smaller, and the water, passing through, washes away the earthy parts, leaving the metallic ones behind. It is then dried in a furnace on iron plates, and ground fine, washed and dried again, and in this state is called *black tin.* To convert it into white tin, *i. e.* pure tin, they carry it to a furnace, where it is melted, and ultimately cast into large oblong square masses, called *blocks.* Before it is exposed to sale in Cornwall, it is carried to one of the five coinage towns, namely Leskeard, Lestwithiel, Truro, Helston, and Penzance; and after examination, the arms of the Duchy of Cornwall are impressed on it with a hammer, after which it is called white tin. The duty on coinage, which is four shillings in the hundred weight, belongs to the Prince of Wales, as Duke of Cornwall, and produces, it is said, a revenue of nearly 70,000*l.* per annum.

Tin plate is an article of manufacture very common among us, and vulgarly called tin. It is iron plated over with tin. The French call it *fer blanc, white iron.* In the year 1681, tin plates were made in England by one Andrew Yarronton, who was sent to Bohemia to learn the manner of making them. But the manufacture was discontinued by his employers, and afterward so much disregarded, as to be reckoned among the projects called the bubbles of the year 1720; however it was revived, and brought to such perfection in the year 1740, that very little of it was imported from foreign parts, our own plates being of a finer gloss than that imported, the latter being hammered, and ours drawn under a rolling-mill. Its particular use need not be described, being so generally known for its excellence in numerous culinary utensils and other purposes.

SOLDER, or SODDER, is much used both by the plumber and the tinman, to unite pieces of lead or tin-plate together. It should be always more easy to be fused than the metal about which it is employed. Good plumber's solder is composed of tin and lead in equal parts, or two parts lead and one tin, fused together; for common purposes, a mixture of pewter and lead is frequently used. The iron used in melting the solder, when applied to any joint, is called a *grozing iron.* To facilitate the process of soldering, powdered resin is generally used; and in finer processes, borax. Besides the solders above mentioned, many others are used by different artists. *Copper* solder is made of copper and tin; *gold* solder, of gold and copper, &c.

The AURUM MUSIVUM, or *Mosaicum*, used for giving a gold colour to plaster of Paris figures, bronzing statues, and other common purposes of gilding, is properly a sulphuret of tin, and may be made by dissolving eight ounces of tin in muriatic acid, precipitating it with carbonate of soda, mixing this precipitate with four ounces of sulphur, and exposing the mixture to a gentle heat for some hours in a mattrass bedded in sand. This very simple process is within the power of every artist who requires this useful matter for painting, or mixing it with melted glass to imitate lapis lazuli. It has no taste, but some specimens have a sulphureous smell.

FOUNDRY is the art of melting and casting all sorts of metals;

particularly brass, iron, bell-metal, &c. The word is also used for a place or house furnished with furnaces, or forges.

Foundry of small works, or *casting in sand.* The sand used by the founders, in casting brass, &c., is yellowish, rather soft, and greasy; but after it has been used becomes quite black, from the charcoal-dust used in the moulds. With this sand a mould is made of dimensions suitable for the things to be cast; wood or metallic patterns are then placed on the mould, and pressed down into the sand, so as to leave their form indented. Along the middle of the mould is laid half a little cylinder of brass, which is to be the chief conduit, funnel, or canal, for running the metal; being so disposed as to touch the ledge at one side, and only reach the last pattern on the other. From this are placed several smaller conduits or funnels, reaching to each pattern, whereby the metal is conveyed through the whole frame. After the same manner they proceed to work the counter-part, or other half of the mould, with the same patterns, in a frame exactly like the former; excepting that it has pins, which, entering holes corresponding thereto in the other, make, when the two are joined together, the two cavities of the pattern fall exactly on each other. When both parts of the mould are sufficiently dried, they are joined together by means of pins; and to prevent their starting or slipping aside by the force of the metal, which is poured in a melted state, through a hole contrived as the chief conduit, they are locked in a kind of press. The moulds thus secured in the press are ranged near the furnace, to be in readiness to receive the metal as it comes out of the crucible. While the moulds are preparing, the metal is fused in an earthen crucible, in a furnace adapted to the crucible, so that the fire may completely envelope it. The founder now takes the crucible out of the fire with a pair of iron tongs, and carries it to the mould, into which he pours the fluid metal. Thus he goes successively from one to another, till his crucible is emptied. When sufficiently cool, the mould is opened, the cast matter taken out, and the sand and moulds applied again to other castings.

The art of casting statues in brass is very ancient; its origin was too remote and obscure even for the research of Pliny. All that we can learn as certain is, that it was practised in perfection, first among the Greeks, and afterward by the Romans; and that the number of statues consecrated to the gods and heroes surpassed all belief. The cities of Athens, Delphi, Rhodes, &c., had each three thousand statues; and Marcus Scaurus, though only edile, adorned the Circus with no less than three thousand statues of brass for the time of the Circensian Games. This taste for statues was carried to such a pitch, it became a proverb, that in Rome the people of brass were not less numerous than the the living people. Among us the casting of statues was but little known or practised before the seventeenth century.

As to the *casting of guns*, it is quite modern. All authors agree, that the first cannon were cast in the fourteenth century. The casting of bells is of a middle standing between the other two.—The use of bells is certainly very ancient; but F. Vansleb assures us, in his second account of Egypt, he found but one bell in all the Eastern churches, and that in a monastery in Upper Egypt. The Turks, indeed, are said to have prohibited the use of them, but we know of one monastery at least in Romelia, that of Kaskerat, in the tower of

which there is a bell belonging to the clock. The matter of these large works is rarely a simple metal, but commonly a mixture of several, as brass, bell-metal, &c.

In casting statues, figures, busts, &c., there are three things chiefly required, *viz.* the *mould*, *wax*, and *core.*

In casting bells, the metal is different; there being, in *bronze*, or the metal of statues, from nine to twelve parts tin to 100 of copper, whereas bell-metal is generally composed of three parts copper and one tin. The mirrors for telescopes consist chiefly of two parts copper and one tin, with smaller portions of brass, silver, and arsenic. The dimensions of the core and the wax of bells are not left to chance, or the caprice of the workman, but must be measured on a kind of scale, which gives the height, aperture, and thickness necessary for the several tones required. It is on the wax also that the several mouldings, and other ornaments and inscriptions to be represented in relievo on the outside of the bell, are formed. The clapper, or tongue, is not properly a part of the bell, but furnished from other hands. In Europe it is usually of iron, and is suspended in the middle of the bell. In China, it is only a huge wooden mallet, struck by force of arm against the bell: whence they can have but little of that consonancy, so much admired in some of our rings of bells.

Bells have been cast in China of an enormous weight; some at Pekin are said to weigh 120,000 lbs. each; one at Nankin weighs 50,000 lbs. Few European bells can compete with these. One at Erfurt, in Saxony, weighs 25,400 lbs.; another at Rouen, in France, weighs 35,000 lbs.; the bells of England sink into comparative insignificance after those. One at Oxford weighs 17,000 lbs.; the great bell of St. Paul's, London, weighs only 11,474 lbs.; and Tom of Lincoln, 10,854 lbs. But, if the testimony of some authors may be relied on, two bells at Moscow far exceed all others in size: one is said to weigh 288,000 lbs.; and the other, the enormous weight of 432,000 lbs.; its height is said to be 19 feet, its circumference at the bottom 21 yards, and its greatest thickness 23 inches.

The casting of *cannons*, *mortars*, and other pieces of *artillery*, is performed like that of statues and bells, as to what regards the mould, furnaces, &c. Cannons are made of a mixture of brass, copper, and tin, or of cast iron, but more commonly with the last. A cannon is always shaped a little conical, being thickest of metal at the breech, where the greatest effort of the gun-powder is made, and diminishing thence to the muzzle; so that if the mouth be two inches thick of metal, the breech is six. Its length is measured in calibres, *i. e.* in diameters of the muzzle. Six inches at the muzzle require twenty calibres, or ten feet in length; there is about one-sixth of an inch allowed as play for the ball. The guns are cast without any core, and afterwards bored with a steel trepan, that is worked either by horses, a water-mill, or steam.

There is a large iron foundry two miles from Falkirk in Scotland, called *Carron Works.* Above 100 acres of land have been converted into reservoirs and pools for water, diverted from the river by magnificent dams built about two miles above the works, which, after turning eighteen large wheels, falls into a tide navigation, that conveys their castings to the sea. These works are the greatest of the kind in Europe, and were established in 1760. At present the buildings are of vast extent; and the machinery is the first in Britain both

in elegance and correctness. There are 1600 men employed, who receive weekly 650*l.* sterling, which has greatly enriched the adjoining country: 6500 tons of iron are melted annually from the mineral, and cast into cannon, cylinders, &c. In the founding of cannon these works have lately arrived at such perfection, that they make above 5000 pieces a year; and their iron guns of the *new construction* are the lightest and neatest now in use, not excepting brass guns. The present proprietors are a chartered company, with a capital of 150,000*l.* sterling.

The words *Crucible* and *Forge* having been repeatedly used, it may be proper to describe them.—A CRUCIBLE is a vessel commonly made of earth, sometimes of iron, plumbago, platina, &c., without any handle; considerably higher than wide; sometimes triangular, sometimes round at top, which is the widest part, and assuming a circular figure below; in which chemists, coiners, goldsmiths, and other artificers, melt gold, silver, &c. Earthen crucibles are made of potter's clay, and hold from one ounce to 800; the iron ones are larger, some holding 10,000 ounces. FORGE signifies a kind of small furnace, wherein smiths and other artificers heat their metals. The word *forge* is also used for a large furnace, wherein iron ore, taken out of the mine, is melted down, though this is not so properly a forge as a furnace. A forge is more properly used for another kind of furnace, wherein pigs of metal are heated, fused, beaten with large hammers, and thus rendered soft, ductile, and fit for use. Of these forges there are two kinds, through which the iron successively passes, before it comes to the smith. *Forge-mills* are turned by water, which serves to raise and let fall one or more huge hammers, to beat and form the iron into bars, anchors, or other massive works.

In LETTER-FOUNDRY, or *the casting of printing letters*, two things are principally to be regarded—the *matter* and the *matrices*. The *matter* or type-metal is composed of lead alloyed with a small portion of antimony. Every letter-founder preparing his own metal, the proportions of lead and antimony are as various as the founders differ in skill and experience. The excellence of type-metal consists in hardness, tenacity, and stiffness; hard, that the face of the type may not be disfigured with a slight blow, that it may endure considerable wear; tenacious, that it may not be too easily broken; and stiff, that the types may not be bent from their rectilinear position.

The *matrices* of the letters are pieces of copper or brass whereon the impression of the intended character has been cut, or struck in a cavity by means of punches. Each letter has its proper matrice; and there are particular ones for points, figures, rules, head-pieces, and other ornaments of printing: excepting the quadrats, which being only of lead, and not intended to leave any impression, are cast without matrices, and only in moulds. Each matrice has its punch made of steel, or iron well tempered. The matrices being struck, and touched up, or repaired where needful, are put at the end of an iron mould enclosed between two thin pieces of board. Every thing belonging to the mould being disposed, they begin to prepare the matter.—The furnace, whereon the basin is placed for the metal to be melted in, is made of the same matter as crucibles. Over the furnace is placed the melting basin, or copper, which is divided into two equal parts by a perpendicular partition. This basin contains the melted type-metal. One workman is employed at each furnace. To run

the metal into the mould, the founder holds in his ladle just enough for one letter. Having filled this ladle with liquid metal, he pours it through a jet or funnel into the matrice or character. He then opens the mould, and takes out the character, and without loss of time shuts it again, replaces the matrice, and casts a new letter. It is incredible with what expedition all this is done; an expert workman being able to cast 3000 letters in a day. The letter being cast, it is examined to ascertain that it is perfect; if it be not, it is thrown among the refuse of the fount. When the letters are cast, they remain to be justified, both as to thickness and height. The justification of the *height* is guided by the *m* of some body of characters already justified. All that remains is to dress the letters, and make that sort of groove, which every letter has in its bottom, in order that it may stand perpendicular. This is performed by turning a long line of them upside down, between two cheeks of wood, which, pressing very tight, enable the workman to run his plane along the line of letters so inverted, and thus to form the groove. The letters are now fit for the printer's use. The perfection of letters thus cast consists in their being all square and straight on every side, of the same height, evenly lined, well grooved, &c. An inspection of the letters themselves will assist the reader in understanding this description, and afford a clearer idea than can be otherwise conceived.

FOUNT, or FONT, among printers, is a set or quantity of characters, or letters of each kind, cast by the letter-founder and sorted. We say a founder has cast a fount of pica, of english, pearl, &c., meaning he has cast a set of characters of these kinds. A complete fount includes capitals, small capitals, little letters, called lower-case, double letters, accented letters, figures, points, characters for reference, spaces, and quadrats. The letter founders have a kind of list, by which they regulate their founts. Some letters being much more used than others, it is necessary to have more of them cast, than of those which occur less frequently. Thus the *o* and *i*, for instance, are always in greater quantity than the *k* or *z*. In a fount of a hundred and fifty thousand characters, the *a* should have eight thousand five hundred, the *c* three thousand, the *e* twelve thousand, the *z* only two hundred, and the rest of the letters in proportion. This, however, is only applicable to the small letters, the capitals being regulated by other rules.

PRINTING is the art of making an impression upon one body by pressing it with another. This art, in some way or other, has been known in all ages. It has been done upon wax, plaster, and iron, by the ancients; their seals, rings, and money prove it. It has been done with wooden blocks upon cotton and silk by the Indians. Printing therefore in this unlimited sense was common to all nations. This art is now divided into four distinct branches. Common or letter-press printing; Rolling-press printing; Calico printing; and Stereotype printing.

Letter-press printing is the most useful and curious branch of the art. To this are chiefly owing our deliverance from ignorance and error, the progress of learning, the revival of the sciences, many of the modern inventions and discoveries, and numberless improvements in the arts, which, without this noble invention, would have been either lost to mankind, or confined to the knowledge of a few.

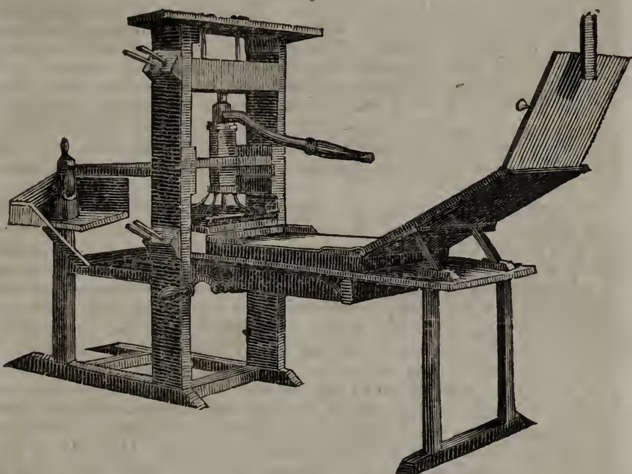
History of printing.—The honour of having given existence to the

present method of printing has been claimed by the cities of Haerlem, Mentz, and Strasburgh: and to each of these it may be applied in a qualified sense, as they severally made many improvements upon one another, in the art. But the origin, however, of printing, was at Haerlem; the first book was printed in the year 1430; and to Laurence COSTER of that city is this discovery to be ascribed; although there is no doubt that soon after GUTTEMBERG as well as FUST and SCHOEFFER, who invented *metal* types, the first types being of *wood*, all added materially to the perfection of this important discovery. It is said, indeed, that Guttemberg invented *moveable* types, and that he began his experiments at Strasburg, and completed them at Mentz; it is also said that COSTER's method was to cut out the letters upon a wooden block; that he took for apprentice JOHN FUST or FAUSTUS, and bound him to secresy, but that FUST, notwithstanding his oath, went off, not only with the knowledge of the art, but with the types and all the implements of his master; first to Amsterdam, thence to Cologne, and afterwards to Mentz. Here, assisted by Schoeffer, they printed a number of bibles in imitation of manuscript, and Fust carried them to Paris for sale. The Parisians were astonished at their exact similarity, and accused Fust of some diabolical art; hence the origin of the story of the Devil and Dr. Faustus. Wooden types not being found sufficiently durable, and not answering expectation in other respects, caused the first invention of *cut metal types*. The honour of completing the discovery is, therefore, due to Peter Schoeffer, who found out the method of forming the characters in a matrice, that the letters might be cast singly, instead of being cut. He privately cut matrices for the whole alphabet; and when he shewed his master, Fust, who appears to have assisted Guttemburg in his attempts to bring the art to perfection, the letters cast from these matrices, Fust was so pleased with the contrivance, that he promised to give Peter his only daughter in marriage; a promise which he soon after performed. Fust and Schoeffer concealed this new improvement, by administering an oath of secresy to all whom they entrusted, till the year 1462, when, by the dispersion of their servants into different countries at the sacking of Mentz by the Archbishop Adolphus, the invention was publicly divulged.

Introduction of Printing into Britain.—Printing was practised at Rome in the year 1467, and the year following it was introduced into England by Thomas Bouchier, Archbishop of Canterbury, who sent W. Turner, Master of the Robes, and W. Caxton, merchant, to learn the art. While there they met with one CORSELLIS, an under workman, whom they induced to come to England. This being accomplished, a press was set up at Oxford, and the first book printed in this country in 1468, by CORSELLIS. Oxford was afterwards found inconvenient to be the sole printing place in England; as being too far from London and the sea. The king therefore set up a press at St. Alban's, and another in the city of Westminster, where several books of divinity and physic were printed. By this means the art grew famous. But although CAXTON has been heretofore considered the *first* printer in this country, and it is now clear that that honour must be conceded to CORSELLIS, yet CAXTON was the first in England that used *fusile types*, and consequently the first that brought the art to comparative perfection; whereas it is said that CORSELLIS printed with separate cut types in *wood*, being the only

method which he had learned at Haerlam. Caxton's printing-office was in the Abbey of Westminster; he pursued his business with extraordinary diligence till 1494, in which year he died very old.

As to the method of printing, we shall only observe, that the types, or letters, are distributed each kind by itself, in cases. The compositor placing the copy of the work before him, picks up letter by letter, and arranges them in order to form words and sentences, till he has composed a page, and so on for the whole work : the degree of expedition and dispatch, with which this is carried on, is not easily to be conceived. The instrument in which the letters are set is called a *composing stick*. When full, the compositor empties it on a thin board, called a *galley*, till he has composed a page. When a certain number of pages are completed, they are firmly placed in due order in a *chase*, which is a rectangular iron frame. In this condition the work is called a *form;* and the next thing is to work it off at the *printing-press*. This press is a very complex machine; its two principal parts are the body of the press, which serves to give the weight or stroke for the impression, and the carriage on which the form is laid.



The Iron Press invented by Earl Stanhope is a very compact and curious machine. It is capable of ten times the force of the common press, with perhaps a tenth of the labour. His principle has been applied, also, in the construction of the common press; and, though not with the success which was at first expected, yet the presses so formed produce a more clear impression, especially for light forms. For a further account of the construction of this press, see Mr. Stower's Printer's Grammar. RUTHVEN's and TREADWELL's printing presses may also be mentioned: in the last there is great simplicity and originality.

The wonderful power of the steam-engine has lately been applied to work the printing-press, and two different machines have been invented for the purpose, by means of which three boys can perform in one hour the work that in the usual way would employ two men eight hours. One of the boys lays the paper on the machine, which of itself distributes the ink on the forms, and prints first one side of the sheet and then the other; the second boy removes the sheets thus printed; and the third boy lays them evenly on the bank. In this way a thousand sheets are printed in an hour. The press is of the rolling kind. Several of the daily newspapers are now printed by steam, as well, indeed, as many valuable books.

Stereotype Printing, although on a principle which was anterior to printing by moveable types, was invented in Scotland by Mr. Ged and Mr. Tilloch respectively, carried to France, and since revived in this country.

The mode of Stereotype Printing is first to set up a page in the common way, with moveable types; and when correct, a cast of Plaster of Paris is taken from it; in this cast the metal for the stereotype is poured; and so for every page, intended to be stereotyped, each page thus forming a single block, or plate. When the plates are prepared, they are printed off like other works; if by a rolling press, the plates are bent to suit the rotundity of the cylinder. But it is only for standard books of very extensive circulation and constant demand, and wherein no material additions, corrections, or alterations, as to plan or size, are wanted, that the stereotype can be used to advantage. Such works are comparatively very few. It is true, the stereotype plates can be, and occasionally are, altered by punching out words or letters, and inserting others; but the trouble of doing this is great, and, of course, expensive.

The *Ink* used in printing is composed of nut or lintseed oil, boiled and purified; with this oil are mixed common resin, to give it tenacity, and soap, to destroy the greasiness of the oil, and make the ink easily wash off; these ingredients, varying in proportions according to the experience of the ink-maker, are ground up with a quantity of lamp-black. For red ink, vermilion is used instead of lamp-black.

Books are printed in China from wooden blocks, cut like those used in printing calico, paper, &c. among us. These blocks are made of a smooth, firm wood, and of the size of the leaf required; upon the face side some able penman draws out the several letters with a kind of pencil; when finished, the block is cut by the sculptor, with his sharp small instruments, which make all the characters appear in relievo on the wood. Their *paper* is inferior to ours in colour. It is made of the inner bark or rind of a kind of rushes, beaten up with water into a pulp or paste, and formed in moulds much like ours. The advantage of the Chinese printing consists in this, that they are not obliged to take off the whole edition at once, but print their books as they need them. Their blocks are easily retouched and made to serve again, and there needs no corrector of the press. Its disadvantages are, that a large room will scarcely hold all the blocks of a moderate volume; the colour of their ink easily fades; and their paper is too thin, apt to tear, and subject to worms, whence it is that we see so few ancient books in China.

Rolling-press printing is employed in taking off prints, or impres-

sions, from copper-plates engraven or etched; an account of which shall appear under the article Engraving.

VARNISH is a thick, glossy liquor, used by painters, gilders, and other artificers, to give a gloss and lustre to their works, and also to defend them from the weather. There are several kinds of varnish, which are divided into two classes, spirit and oil varnishes. The finest of the former class is copal varnish, made of gum-copal dissolved in spirit of wine, or essential oils. Shell lac, and the other gum-resins are next. The *white varnish* is made of oil of turpentine, fine turpentine, and mastic. The *transparent varnish*, used for window-blinds, is made of mastic dissolved alone, or with the addition of Canada balsam, in oil of turpentine. *Drying varnish* is made of oil, turpentine, and sandrac, melted together. The *common varnish* is only yellow or black resin dissolved in oil of turpentine. The word varnish is also used for the glossy coat wherewith potters' ware,China ware, &c., are covered to give them a lustre; but the common term *glaze* is more proper, as it is in reality a glass. This will be noticed under Pottery.

LACQUER is a thin, transparent, or gold coloured varnish, generally put on metals, such as tin, brass, or copper, to prevent them from tarnishing, and give them a clear yellow or gold colour. The use of lacquer on brass lamps, locks of doors, nails, and many other articles of the same nature, is very general; it is chiefly composed of seed-lac and gamboge, dissolved in alcohol. Turmeric, annotto, dragon's blood, &c., are also used, as well as gamboge, for imparting to varnish different colours.

JAPANNING is the art of varnishing and drawing figures on wood, in the same manner as is done by the natives of Japan. The substances which admit of being japanned are almost every kind that are dry and rigid, or not too flexible or extensible; as wood, metals, leather, and prepared paper. Wood and metals do not require any other preparation, but to have their surface perfectly even and clean: but leather should be securely strained, either on frames or boards, as its bending or forming folds would otherwise crack and force off the coats of varnish; the paper should be treated in the same manner, and have a previous strong coat of size; but it is rarely made the subject of japanning, till it is converted into *papier mache*, that is, reduced to pulp, mixed with gum and size, and dried to hardness, or wrought by other means into such form, that its original state, particularly with respect to flexibility, is lost. One principal variation from the method formerly adopted in japanning is the omission of a priming, or under coat in the work to be japanned. Such priming is at present retained in the French japanning, but in the Birmingham manufactures it has been rejected; the latter, when good of their kind, never peel or crack; while the Parisian japans crack, and fly off in flakes; hence the Birmingham manufacture is greatly preferable to the French. Laying on the colours in gum-water, instead of varnish, is also another variation from the old practice; but the much greater strength of the work when laid on in varnish or oil prevails with great reason in all regular manufactures: however, they who practise japanning on such pieces as are not exposed to much violence may paint with water colours, and then finish with the proper coats of varnish: and if the colours be tempered with the strongest isinglass size, and honey instead of gum-water, and laid on very flat and even, the work will no

be much inferior in appearance to that done in oil, and will last a long time.

Although Birmingham is now the chief mart for japanned wares, they are also got up in many other places in this country; *Pontypool* has been long noted for its Japan wares; some are also painted at *Bristol.*

ENCAUSTIC PAINTING is generally used on wood, for which it is deemed preferable to varnish; it is also applied to *papier mache* scented boxes, saw-dust boxes, &c. It consists in melting white wax with gum mastic, reducing the mixture when cool to powder, and with a strong solution of gum arabic in water, mixing this powder and the colours to be used as paint together; others make a similar composition in a liquid form, with the solution of gum arabic, and keep it ready for mixing with their colours when they paint. It must be thinned or mixed with water only. When the painting is heated after the pencil, it dries instantly, and not only leaves a gloss, preferable to varnishes, but also gives the colours that soft mellow tone, which is so pleasing in the old paintings of the Italian masters.

ENAMEL is a preparation of coloured glass, which, when ground to powder, is used in enamel painting and enamelling. Enamels have for their basis a pure crystal glass, ground up with a fine oxide of lead and tin, prepared for the purpose. These ingredients baked together are the matter of all enamels, which are made by adding colours of this or that kind of powder to this matter, and melting or incorporating them together in a furnace. There is an enamel for imitating precious stones; and there is a kind used by jewellers and goldsmiths, on gold, silver, and other metals.

Painting in enamel consists in painting with metalline colours, ground, reduced to powder, and used, like other colours, with a pencil: then covering them with a powdered enamel, which is fused, baked, and vitrified by force of fire in a furnace. The art of painting in enamel is very ancient; and appears to have been first practised on earthenware. As early as the days of Porsenna, king of Tuscany, we hear of beautiful vases made in his territories enamelled with various figures: though far short of those afterward made at Fayenza, in the time of Raphael and Michael Angelo. There are still some of these vases in the cabinets of antiquaries; in all which, the design or drawing is much better than the colouring. They were at that time only acquainted with two colours, black and white; except a faint kind of carnation for the face and other parts.

BRICKS. The earliest mention of bricks is in the Old Testament, by the sons of Noah. Bricks were also used in the tower of Babel, and the walls of Babylon. Unburnt bricks were used in Egypt; the making of them was one of the tasks imposed by the Egyptians upon the Israelites while in that country. At what period bricks were first burnt, cannot be exactly determined; but the Greeks were certainly acquainted with the art. Under the first kings of Rome, they built with massive squared stones, which they learned from the Tuscans; but toward the latter time of the republic they used bricks, borrowing the practice from the Greeks. In the East, bricks were baked in the sun; the Romans used them unburnt; only leaving them to dry in the air for four or five years. Barbaro, in his Commentary on Vitruvius, recommends singular bricks; namely, triangular ones, every side a foot long, and only an inch and a half

thick. These, he observes, would have many conveniences; and Sir H. Wotton wonders that they have never been used, seeing that they are recommended by so great an authority.

Statute bricks, when burnt, should be four inches and a half broad, two and a half thick, and nine inches long; they are formed by means of a wooden mould, dried in the open air, and then baked or burnt, to serve the purposes of building. The first step in the process of brick-making is casting the clay. The next step is to tread or temper it. In the neighbourhood of London this is done by means of a horse-mill. The goodness of bricks depends chiefly upon this preparation. The clay itself, before it is wrought, is generally brittle, but by working and incorporating it together with water, the whole becomes a homogeneous paste. Bricks are commonly of a red colour, though there are some made at Woolpit, in Suffolk, that are white. Bricks may be made of any clayey earth that is clear of stones, but all will not burn red. The clay ought to be dug before winter, but not made into bricks before spring. Stourbridge clay and Windsor loam are esteemed the best for making such bricks as will stand the fiercest fires.

Bricks are burnt either in a *kiln*, or *clamp*. Those in a kiln are burnt, either with wood or coal, as may suit the particular convenience of the spot for obtaining most readily one or the other material; and as the fire can be, in kilns, continued at the pleasure of the superintendant, the bricks can be more equally and uniformly burnt. About London, however, bricks are chiefly burnt in *clamps*, built of the bricks themselves, after the manner of arching in kilns, with a vacancy between every two bricks for the fire to play through; but with this difference, they span it over by making the bricks project one over another on both sides of the place, for the wood and coal to lie in till they meet, and are bounded by the bricks at the top, which close all up. The place for the fuel is carried up straight on both sides, till about three feet high; then they almost fill it with wood, and over that lay a covering of coal. They also strew coal over the clamp, upon every row of bricks, which are packed loosely, so that the fire may more readily communicate with each row; and lastly, they kindle the wood, which gives fire to the coal: when all is consumed, they conclude the bricks are sufficiently burnt. Latterly, however, a very large portion of the bricks made around the metropolis are burnt with *cinders* obtained from the ashes collected from the different houses in London; the fine sifted ashes are mixed also in certain proportions with the clay, which contribute, doubtless, to the hardness and durability of the bricks.

The different kinds of bricks made in this country are *place bricks*, *gray* and *red stocks*, *marl facing bricks*, and *cutting bricks*. The *place bricks* and *stocks* are used in common walling; the *marls* are made about London, and used in the outside of buildings; these are very beautiful bricks, of a fine yellow colour, hard, well burnt, and thought by some superior to the stocks. The finest kind of marl and red bricks are called *cutting bricks;* they are used in the arches over windows and doors. There is also a fine kind of bricks, made near Ipswich, used for *facing*. The *Windsor* bricks, or fire bricks, which are made at Hedgerly, a village between Windsor and Beaconsfield, are red bricks, containing a very large portion of sand: these are used for coating furnaces, and lining the ovens of glass-houses, where they

stand the utmost fury of the fire. *Dutch Clinkers* are imported, and are long narrow bricks, of a brimstone colour, very hard and well burnt; they appear almost vitrified by heat. Dr. Percival, in his essays, proves, by an experiment upon bricks, that the practice of lining wells with bricks is very unwholesome, as they make the water hard.

Scouring bricks consist of a mixture of clay and sea-sand slightly baked. They are made, we believe, only at or near Bridgewater, in Somersetshire, from clay obtained on the sides of the River Parret, which flows through the town. This peculiar mixture is produced by the velocity with which the tide flows at that port. These bricks are sent to various parts of England.

TILE is a sort of thin laminated brick, used for the roofs of houses; or, more properly, a fat clayey earth, moulded into a certain form, and dried and burnt like bricks. Tiles are made of better clay than bricks. According to a statute of Edward IV., the clay for tiles must be cast up before the first of November, and not made into tiles before March. The method of burning is similar to brick, but tiles are always burnt in kilns. There are various kinds of tiles for building; but *hollow* and *plain* tiles are the chief. *Dutch tiles*, or, as they are sometimes called Flemish tiles, are of two kinds, ancient and modern. The *ancient*, for chimney foot-pieces; they were painted with ancient figures and moresque devices, but came short, both as to the design and colouring, of the modern ones. The more *modern* Dutch tiles are commonly used plastered up in the jambs of chimneys, and much better glazed and painted than the former kind. But these seem to be made of the same white clay as our glazed earthenware. Both these are now fallen into disuse. The *blue slates* used to cover houses are sometimes called tiles.

Tuilerie, tile-kiln, or a tile-work, implies a large building, with a drying place covered at the top, but furnished with apertures on all sides, through which the wind, having admittance, dries the tiles, bricks, &c. The garden of the Louvre in Paris was called the *Tuileries*, as being a place where tiles or bricks were anciently made; a magnificent palace was afterward begun there in 1564, by Catharine de Medicis, wife of Henry II., finished by Henry IV., and splendidly adorned by Louis XIV.

A PIPE is a well-known machine, used in smoking tobacco, consisting of a long slender tube, made of clay. Pipes are of various fashions, as long, short, plain, worked, white, varnished, unvarnished, and of various colours, &c. The Turks use pipes three or four feet long, made of rushes, or wood bored; at the end of which they fix a kind of nut of baked earth, which serves as a bowl, and which they take off after smoking. The clay with which our pipes are made is dug up in several parts of England, as at Pool in Dorsetshire, Biddeford in Devonshire, &c. It is brought to the makers in lumps of six or eight inches square. When used, it is thrown into a large pan, moistened with water, and beaten and moulded till it is soft and mellow, and exceedingly well tempered. Thence it is removed to the rolling board, where the workman readily breaks off an exact quantity for a couple of pipes, rolls out both at once, one in each hand, to the proper length and form, leaving a sufficient quantity at one end for the bowl; then lays them on a board by dozens, where they remain till they have acquired a greater degree of hardness. The tube

is then formed by running a wire through the clay. The pipe, before the wire is withdrawn, is closed in a mould of polished iron, and now, by the help of another machine, the bowl instantly receives its form, and the whole pipe is returned in its exact figure. It is now again left to harden yet more, before it undergoes its last smoothing and finish, which is quickly done by a kind of knife, &c. and thence it is taken to the kiln.

The *Kilns* are of various sizes; some hold twenty gross, others eighty, and even a hundred; but the more usual size contains forty or fifty gross of pipes. Here they are six or eight hours exposed to a strong clear fire. This brings them to their state of whiteness; and is the last operation. They are then taken and packed up in boxes for sale. Great quantities are exported from England to foreign countries. Workmen say, the blackest clay often burns the clearest, and makes the whitest pipes. The wholesale price varies from sixteen to thirty pence per gross; some kinds are higher. This manufacture is carried on in many cities and places in England; as London, Bristol, Taunton, Norwich, Hull, Liverpool, &c.

POTTERY is the art of making earthen pots or vessels; or the manufacture of earthenware. The clay used for this purpose is a soft, viscous earth, of different kinds and properties, and may be found in various places. The better kinds of *English stone ware* are composed of *pipe clay* and *pounded flints*, in the proportion of four parts of flints to eighteen parts of clay. The *yellowish white* or *queen's ware*, so generally in use, is made of the same materials, with larger proportions of clay. The *common red earthenware* appears to be merely common clay, similar to that with which bricks are made. The first is *glazed*, by throwing sea-salt into the furnace in which it is baked, when the heat is strong: the salt is converted into vapour, and this being applied to the surface of the stone-ware, vitrifies it, and forms an excellent glazing. The *queen's ware* is *glazed* by dipping the baked ware into a mixture of the consistence of cream, composed of white lead, ground flint, and ground glass, and submitting the ware afterwards to heat. The composition is, however, sometimes varied. But the glaze for most of our common earthenware containing so large a portion of lead, such vessels should never be employed for acid liquors of any kind, as the acid will dissolve the lead, and thus render whatever is contained in the vessel *poisonous*.

Among the instruments used in pottery, the *wheel* and *lathe* are the principal; the first for large works, the second, for small. The potter's wheel consists principally in its *nut*, which is its beam or axis, the pivot of which plays perpendicularly on a free-stone sole at the bottom. From the four corners of this beam proceed four iron bars, which, forming diagonal lines with the beam, descend and are fastened at bottom to a strong wooden circle. On the top of the nut is laid a piece of the clay to be turned and fashioned. The wheel, thus disposed, is encompassed on all sides with four different pieces of wood, sustained on a wooden frame. The hind piece, which is that whereon the workman sits, is made a little inclining towards the wheel. On the fore pieces is placed the prepared clay; by the workman's side is a trough of water, wherewith, from time to time, he wets his hands, to prevent the clay's sticking to them. The potter having prepared his clay, and laid a piece of it, suitable to the work he intends, on the top of the beam, turns the wheel, till it has got the proper velocity; form-

ing the cavity of the vessel, and widening it till it has received its intended form. When the vessel is found to be too thick, he pares off what is redundant with an instrument. When the vessel is finished, he takes it off the circular head by a wire passed underneath the vessel.

The potter's *lathe* is also a kind of wheel, but simpler and slighter than the former. Its three principal parts are an iron beam or axis, placed perpendicularly; a small wooden wheel, placed horizontally at the top of the beam, and serving to form the vessel on; and a thick wooden wheel placed horizontally at the bottom. The potters work with the lathe with the same instruments, and after the same manner, as with the wheel. The lathe and wheel serve only to give the form of the body of the vessel; the feet, handles, and other occasional ornaments are made and set by the hand. If there be any sculpture in the work, it is usually done in earthen or wooden moulds, and afterwards stuck on the outside of the vessel.

DELFT-WARE is a kind of pottery of baked earth, covered with an enamel, or white glazing, which gives it the appearance of porcelain. It is sometimes ornamented with paintings of figures, &c. The basis of this pottery is clay, which is mixed in such quantity as to produce enough ductility to be worked, moulded, and turned easily, without cracking or shrinking too much in drying or baking. The vessels, being slightly baked, are covered with an enamel or glazing. They are then painted with colours composed of metallic oxides, mixed and ground with fusible glass. When dry, they are again baked, and exposed to a heat capable of fusing the enamel, and completing the baking.—The furnace and colours used for painting this ware are the same as for porcelain. For making these *enamels* there are many recipes, but all of them are composed of sand and flints, vitrifiable salts, and oxide of lead or tin. The sand must be perfectly vitrified, so as to form a gloss considerably fusible. The kinds of clay chiefly used for delft-ware are blue and green: to give it a greater solidity, some red clay is added; which, on account of its ferruginous matter, possesses the requisite binding quality. Three parts blue clay, two red, and five marl, form the composition used in several manufactures. See ENAMEL, page 162.

PORCELAIN, or CHINA, as it is commonly called, because formerly brought chiefly from that country, is imported occasionally into Europe from many other places of the east, especially Japan, Siam, Surat, and Persia. But very good porcelain is now made in various parts of this country, as well as at Dresden, and in France.

The Chinese call this manufacture *tse-ki;* the origin of the term *porcelain* does not appear to be decidedly known; the French call it *porcelaine;* the Italians *porcellana.* Whether porcelain was known to the Romans is uncertain, as the Roman writers give us no decisive information concerning it. It is not known who was the inventor of this elegant manufacture; the Chinese annals are said to be silent about it; it appears, however, pretty certain, that porcelain must have been known as early as the fifth century.

It is said that the porcelain of China is made chiefly, if not entirely, at Kingteching, which has had the honour of supplying the greatest part of the world with this commodity, but England now bids fair to deprive China of much of her traffic in this elegant production.

The characteristics of porcelain are hardness, sonorousness, and semi-transparency; to which may be added a semi-conchoidal splintery fracture, approaching that of glass; this last forming a distinctive character between porcelain and pottery, the fracture of pottery being granular.

The most perfect and beautiful porcelains of Japan and China are said to be composed of two distinct earths, one of which is called *Petuntz*, most probably a species of feldspar, and which melts in a strong fire, and another which is infusible by itself: by the union of these two earths, a porcelain is produced which scarcely vitrifies at the utmost furnace heat which art can excite. It is also very hard, beautifully semi-transparent, very white when not artificially coloured, tough and cohesive, so that it may be made very thin, and bears sudden heating and cooling without cracking.

Of the beautiful European porcelains, it does not appear that any of them unite all the excellences of the Oriental, yet the chief superiority of this last appears to be simply its absolute infusibility; this defect in European porcelain, for the common uses of it, is certainly of no importance.

The art of forming mixtures for porcelain in this country is comparatively in very few hands. The late Mr. WEDGWOOD carried it to considerable perfection at ETRURIA in Staffordshire, where, as well as at STOKE-UPON-TRENT, WORCESTER, COAL-PORT, and at CHELSEA, this elegant manufacture is now carried on.

The *Chelsea China* may compete with that of *Meissen* near Dresden, and of *Sevre* near Paris. Of that manufactured at *Worcester* it may be said, that it wants nothing to make it of equal value with the Chinese, but to be brought five or six thousand leagues. In the manufacture carried on by *Barr*, *Flight*, and *Co.*, perseverance has accomplished very great improvements in the texture, whiteness, and beauty of the porcelain. The paintings too are brought to a pitch of excellence, far exceeding any thing formerly seen in this kingdom, &c. British industry, by rivalling the foreign manufactures, has rendered unnecessary the importation of the Chinese, French, or Dresden porcelain; for several years little porcelain has been imported from China or elsewhere. Indeed for the fineness of the grain of the matter, beauty and turn of the vessels, exactness of design, lustre of the colours, &c., our works have been many years in high repute, and are every day gaining greater estimation. In justice to the manufacture it should be observed, that in different parts of the kingdom even well-informed people are so far unacquainted with its excellence, as to believe the delft ware of Staffordshire the only Worcester china; nor can they be persuaded to think, that what is really the produce of the Worcester manufacture is any other than real China ware, or at least some foreign porcelain. In this they are misled by the old criterion, that of semi-transparency, which is no longer peculiar to foreign porcelain.

In concluding this article we may mention that in the neighbourhood of Coal-Port in Shropshire, on the banks of the Severn, is a water-wheel *one hundred feet* in diameter, which turns an apparatus for reducing calcined flints to powder for the making of English porcelain. It may be also useful to observe, that the ingenious Mr. WEDGWOOD invented a composition for *mortars* which resists completely the action of acids, and hence, in chemistry and pharmacy

mortars made of such composition have nearly superseded the use of *marble mortars*, which are affected more or less by even very weak acids.

GLASS is a transparent, solid, brittle body, produced by a mixture of earthy or metallic with saline substances melted together by an intense heat. Hence silica, when mixed with the fixed alkalies, and exposed to a strong heat, readily enters into fusion ; and, being suffered to cool down to a pasty consistence, may be moulded into any shape. Metallic oxides are sometimes added, as well to assist in the fusion, as to communicate certain colours to the mass ; that of manganese however, which in a certain proportion gives a purple tinge to glass, in a smaller quantity frees it from the stains of combustible matter, whence it has been called *glass-maker's soap.*

Glass when red-hot is ductile and may be fashioned into any form. Ordinary substances exert no action on it : a few chemical agents only have the power of combining with, or decomposing it, one of which is the galvanic battery.

The uses of glass are almost innumerable ; it undoubtedly forms some of the most elegant, as well as at once the most useful and luxurious articles with which we are acquainted. A drinking glass, partly filled with water, and rubbed on the brim with a wet finger, yields musical notes, higher or lower as the glass is larger or smaller, and more or less full, and makes the liquor vibrate. This property led Dr. Franklin to the invention of a very pleasing musical instrument, the *harmonica. Fluoric acid* also acts upon it, and dissolves it very quickly ; this acid indeed, has been used to engrave on glass with the most complete success ; and the art of etching and sketching figures on glass, by means of fluoric acid, used in the same manner as aquafortis is on copper, would have attracted the admiration of the world, had it not been performed too cheaply to affect public vanity.

The invention of glass is very ancient : the Books of Moses and of Job speak of it : although many authors contend that Aristophanes was the first writer who mentions glass. Aristotle, who flourished three centuries and a half before the Christian era, proposes two problems concerning glass : one is why we see through it ; the other, why it will not bend. After him the word occurs often enough : Lucian mentions large drinking glasses ; and Plutarch says, that the fire of tamarisk wood is the fittest for making glass. Among the Latin writers, *Lucretius* is the first that takes notice of glass.—*Nisi recta foramina tranant, Qualia sunt vitri.* Glass was invented, according to Pliny, by accident, in Syria, at the mouth of the river Belus, by certain merchants driven thither by the fortune of the sea. Being obliged to live there, and dress their victuals, they made fire on the ground ; and there being some of the plant kali upon the spot, this herb was burnt to ashes ; the sand or stones of the place accidentally mixed with it, and a vitrification was undesignedly made, whence the hint was taken and easily improved. However old the knowledge of glass may be, the art of making and working it appears of no great antiquity. The first place mentioned for making it is Sidon in Syria, which was famous for glass and glass-houses, as observed by Pliny. The first time we hear of glass made among the Romans was in the time of Tiberius ; when Pliny relates, that an artist had his house demolished for making glass malleable, or rather flexible ; though Petronius Arbiter states, that the Emperor ordered the artist to be beheaded for his invention. Venice

for many years excelled all Europe in the fineness of its glasses. But within these fifty years the French and English have not only equalled, but even surpassed the Venetians; so that we are now no longer supplied from abroad. The French made a considerable improvement in the art of glass-making, by the invention of a method to cast very large plates, till then unknown, and scarcely practised yet by any but themselves and the English. The earliest positive authority relating to the use of glass in windows, is said to be in *Lactantius*, one of the Fathers of the Christian church in the third century. *Bede* mentions that artificers in glass were brought over to England in 674. Glass windows were not used till 1180, and were for a long time considered marks of great magnificence. *Painted glass* is supposed to have been introduced in the reign of John; our first specimens are, however, of the time of Henry III. The regular glass manufacture was begun in England in 1557. We cannot possibly enter into the detail of composition of the different varieties of glass; but we may state that *flint-glass* is made by melting in a very strong fire one hundred and twenty pounds of white sand, fifty pounds of red lead, forty pounds of the best pearl ashes, twenty pounds of nitre, and five ounces of manganese. *Crown* or window glass contains no lead; it consists of barilla or potash, fine sand, and nitre, with a small quantity of borax and arsenic. But there is no end to the varieties and qualities of glass. *Bottle-glass* is the coarsest of all, consisting of kelp and common sand; or sand and the refuse of the soap boiler.

Ingredients of Glass.—The chief materials used in the composition of glass, we have observed, are the fixed alkalies, and sand, or silex. Manganese is likewise added, to give whiteness and transparency to glass; red lead is used to increase its ductility and fusibility. There are three sorts of furnaces used in glass-works: one, to prepare the frit; a second, to work the glass; and a third, to anneal it. After having properly mixed the ashes and sand, they are put into the first furnace, where they are burned or calcined for a sufficient time, and become what is called frit;—which, being fused afterwards in pots or crucibles of pipe-makers' clay in the second furnace, is fit for blowing. The annealing furnace is destined to cool the glass very gradually; for if it be exposed to the cold air immediately after being formed into utensils, it will fall down into a thousand pieces as if struck with a large hammer. There are three principal kinds of glass, distinguished by the form or manner of working them, viz. round glass, as our vessels, phials, drinking glasses, &c.: table or window-glass, of which there are divers kinds; and crown-glass and plate-glass, or looking-glass.

Working or blowing round Glass.—The furnace in which the glass is melted is round, and has several apertures, through one of which the fuel is introduced; the others serve to lade out the melted metal, which is fused in pots made of tobacco-pipe clay, or some other material capable of resisting the heat. When the ingredients are perfectly fused and sufficiently hot, part of the melted matter is taken out at the end of a hollow tube about three feet long, which is dipped into it and turned about till a sufficient quantity is taken up; the workman then rolls it gently upon a plate of iron or marble, to unite it more intimately; he then blows through the tube, till the melted mass at the extremity swells into a bubble; after which, he rolls it again on a smooth surface to polish it, and repeats the blowing till the glass is

brought to the size and form necessary for the acquired vessels; he shaping it with pincers or scissors, according to circumstances.

Crown or *Window Glass* is formed in a similar manner, except that the liquid mass is blown into large globes, and detached from the first iron tube by the assistance of a second person, who fixes his iron tube at the opposite side of the globe; and the man who originally blew it, then separates his tube from it; the mouth of the globe is gradually widened till it ultimately becomes, in the hand of the workman, a circular planisphere.

The best window-glass was formerly made at Radcliff; but at present the crown as well as the green and black-bottle glass is brought principally to London from Newcastle-upon-Tyne. Glass is, however, made at Bristol and at Stourbridge: some of the finer kinds of glass are made in London.

Plate Glass for *Looking-Glasses* and some superior *windows*, is made by causing the melted glass to flow upon a table made either of pot-metal or of copper, with iron ledges to confine the melted matter; and as it cools, a metallic roller is passed over it, to reduce it to an uniform thickness. After being annealed, it is ground and polished thus:—The glass is laid horizontally, upon a flat stone table made of a very fine grained free-stone; then taking a smaller piece of rough glass, and fastening it to a heavy wooden plank, the workmen continue to rub one glass backwards and forwards upon another, till they acquire a great degree of smoothness. While they are thus employed, they pour in water and sand, then a finer sort of sand, and lastly powder of smalt. When the grinder has done his part, by bringing the glass to an exact plainness, it is turned over to the polisher, who with the fine powder of Tripoli stone, or emery, and a putty formed of lead and tin calcined together, brings it to a perfect evenness and lustre.

Glass is coloured *blue* by oxide of cobalt; *red* by the oxide of gold; *green* by oxides of copper or iron; *yellow* by oxides of silver or antimony; and *violet* by oxide of manganese.

BOTTLES. Glass bottles are better for liquors than those of stone. Foul glass bottles are cleaned by rolling sand or small shot in them. But it frequently happens, that some of the shot are left behind; and when wine or beer is again poured into the bottles, this mineral poison will slowly dissolve, and impregnate those vinous liquors with its deleterious qualities. The sweetness which is sometimes perceived in red port wine may arise from this cause, when it is neither designed nor suspected. It is much better, therefore, to use nothing but sand, or the dust of coal, and coarse brown paper, which are very effectual for the purpose.

POT-ASHES have been sufficiently described in the preceding parts of this work. See pages 89 and 121.

BARILLA is an impure carbonate of soda, and is made in the same manner as pot-ash, by burning marine plants, particularly *salsola;* the strongest kind of this alkaline matter is prepared near Alicant, in Spain, and exceeds the kelp made on the British shores by containing nearly four times the quantity of pure alkali in any given weight. A manufacture of soda for glass has been established at Wormbridge, near Wellington, in Shropshire, by decomposing common salt with sulphuric acid obtained from the martial pyrites, which abound in that country. Barilla and kelp are both used in glass-making, bleaching,

the manufacture of soap, washing, &c. See Soda, pages 89 and 122.

PUTTY sometimes denotes powder of calcined tin, which is used in polishing and giving a lustre to works in marble, glass, iron, and steel. The *putty* commonly used by glaziers is composed of lintseed-oil and whiting, without the addition of white lead. The whiting is first powdered very fine, then oil and white lead (should any be deemed necessary for the purpose intended) are well wrought with it, and incorporated together. The mixture is beaten till the whole is thoroughly blended, and becomes a tenacious mass like dough.

A PIN is an article well known. It is not easy to trace the invention of this useful implement. It is first noticed in the English Statute-Book, in the year 1483, prohibiting foreign manufactures. In the reign of Henry VIII. it would seem pins were then considered a new invention, and probably brought from France, where they were esteemed articles of luxury: hence arose the term pin-money, an allowance made by the husband to the wife for her own spending. The art, however, of making pins from brass wire, was not known in England before 1543; before that period they were either made of bone, ivory, or box.

Pins are made in the following manner:—The brass wire, reduced to its proper dimensions by drawing, is straightened, and afterwards cut into lengths of three or four yards, and then into smaller ones, every length being sufficient for six pins; each end of these is ground to a point, upon grind-stones by boys, who will point 16,000 pins in an hour. When the wire is thus pointed, a pin is taken off from each end; and this is repeated, till it is cut into six pieces. The heads are next formed by means of a spinning wheel; one piece of wire being thus with astonishing rapidity wound round another, and the interior one being drawn out, leaves a hollow tube between the circumvolutions; it is then cut with shears, every two circumvolutions or turns of the wire forming one head; these are softened by placing them in a furnace till red hot. When cold they are distributed to children, who sit with anvils and hammers before them, which they work with their feet by means of a lathe, and taking up one of the lengths, they thrust the blunt end into a quantity of the heads which lie before them, and catching one at the extremity, they apply them immediately between the anvil and hammer, and by a motion or two of the foot, the pin and the head are fixed together in a very expeditious manner. The pin is now thrown into a copper containing a solution of tin, and the lees of wine. Here it remains for some time, when it assumes a white, though dull appearance; to give it a polish, it is put into a tub with a quantity of bran, which is set in motion by turning a shaft that runs through its centre, and thus, by means of friction, it becomes entirely bright. The pin being complete, the bran is winnowed from it, leaving the pin fit to be stuck in paper for immediate sale. Pins are distinguished in commerce by numbers; the smallest are called *minikins;* the next *short whites;* the next larger ones No. 3, 3 1-2, 4, 4 1-2, and 5, to the 14th, whence they go by twos; viz. 16, 18, and 20, which is the largest size. Pins are sold in papers and packets as thus numbered, and also by the pound weight in assorted sizes. There are also *black* pins, pins with double heads, &c.

NEEDLES were first made in England by a native of India, in 1545,

but the art was lost at his death; it was however recovered by one Christopher Greening in 1560. This familiar little instrument makes a very considerable article of commerce; and the consumption is almost incredible. The German and Hungarian steel is of most repute for needles. The steel being placed in the fire, and afterwards hammered to bring it to a round form, is passed through successive holes of the wire-drawing machine, till it is of the proper size; it is then cut into suitable lengths: these pieces are flatted at one end on the anvil, to form the head or eye; they are then put into the fire to soften them further, thence taken out and pierced at the extreme of the flat part on the anvil, by a puncheon of well-tempered steel, and laid on a leaden block, to bring out, with another puncheon, the small piece of steel remaining in the eye. The corners are then filed off the square of the heads, and a small cavity filed on each side of the flat of the head; this done, the point is formed with a file, and the whole filed over: they are then made red hot over a charcoal fire, and afterwards thrown into a basin of cold water to harden. When hardened, they are laid in a shovel on a brisk fire to temper, and take off their brittleness. They are then straightened one after another with the hammer; the next process is the *polishing:* 12 or 15,000 needles are ranged in small heaps on a piece of new buckram sprinkled with emery dust; they are afterwards sprinkled with oil of olives; lastly the whole is made up into a roll, and laid on a polishing table, and over it a thick plank loaded with stones, which two men work backwards and forwards, till the needles are polished. When taken out, they are washed with hot water and soap, and wiped in bran. The good are now separated from the bad, and the points smoothed on an emery stone. This operation finishes them; and nothing remains but to make them up in packets.

Needles are destinguished into *common* and *Whitechapel*, this last by having a *c* marked upon each needle; *sharps*, *betweens*, and *blunts; darning* needles, *double longs*, and *No*. 50, &c.; besides which there is the *netting* needle, the *knitting* needle, the *glover's* needle, with a triangular point, the *tambour* needle, *surgeon's* needles, &c.

BLEACHING is the art of whitening linens, stuffs, silk, and many other substances.

Although the ancient inhabitants of India, Egypt, and Syria, knew in some sort a method of carrying off the colouring matters with which cloth is stained; and although Pliny mentions that the Gauls were acquainted with a lixivium extracted from the ashes of vegetables, and knew how to combine it with oil to form soap, yet their knowledge of bleaching was very imperfect. Even in India, at the present time, it is said that the art of bleaching is no further advanced than it was in the time of Herodotus. Indeed in Europe, till toward the end of the 18th century, the art of bleaching advanced slowly; but the discovery of *oxymuriatic acid*, as a material for bleaching, has given an impulse unknown in any other art.

Bleaching Silk. Raw silk is put into a thin linen bag, thrown into a vessel of boiling river water in which soap has been dissolved, and then boiled two or three hours, the bag being turned out several times; taken out, beaten, and washed in cold water, mixed with soap and a little indigo. The indigo water being slightly wrung out, the silk is put into a vessel of cold water; after taking it out of which, it is wrung, and all the water and soap expressed; shaken

out to untwist and separate the threads ; and hung up in a kind of stove made on purpose, where sulphur is burnt, the vapour from which gives the last degree of whiteness to the silk.

Bleaching of woollen stuffs.—There are three ways of whitening these ; the first, with water and soap ; the second, with vapour of sulphur ; the third, with chalk, indigo, and vapour of sulphur. For the first ; the stuffs, being taken from the fulling mill, are put into soaped water rather hot, and worked afresh by force of arms over a bench, which finishes the whitening the fulling-mill had begun ; and lastly, washed out in clear water and dried ; this is called the *natural way of bleaching*. In the second method, they begin by washing the stuff in river water ; it is then laid to dry on poles, and, when half dry, spread out in a kind of stove well closed, wherein is burnt sulphur ; the vapour, diffusing itself, sticks by degrees over all the stuff, and gives it a fine whitening ; this is commonly called *bleaching by the flower*. In the third method, after the stuffs have been washed, they are thrown into cold water impregnated with chalk and indigo ; after they have been well agitated here, they are washed afresh in clear water, half dried on poles, and spread in a stove to receive the vapour of the sulphur, which finishes the operation. This is not esteemed the best method of bleaching, though agreeable enough to the sight. It may be here observed, that when a stuff has once received the steam of sulphur, it will scarcely receive any beautiful dye but black or blue, unless well washed in alkaline ley, and rinsed previously to being put into the dye vat.

Bleaching of Hollands or fine linens.—After taking them from the loom, while yet raw, they are steeped in clean water, rinsed out and cleared of their filth in a tub filled with a cold lixivium or ley. When taken out of the ley, they are washed in clean water, spread on a meadow, and watered from time to time. After lying a certain time on the ground, they are boiled in a new ley of potash or barilla, and again washed in clean water, soaped with black soap, passed through rubbing boards, and the soap washed out in clean water ; they are then steeped in sour milk, which finishes their whitening and scouring, gives a softness, and makes them cast a little nap : when taken out of the milk, they are washed in clean water for the last time. After all this process, they give the linen its first blue, by passing it through water, wherein a little starch and smalt, or powder blue has been steeped.—Lastly, the proper stiffness and lustre are given with starch, pale malt, and certain gums, the quantity and quality whereof is adjusted according to occasion. In fine weather, the whole process of bleaching is completed in a month's time ; in bad, it takes up six weeks or more.

Coarse linens are taken from the loom, and laid in wooden frames full of cold water, where, by means of wooden hammers worked by a water-mill, they are beaten so as insensibly to wash and purge themselves of their filth ; then spread on the ground, where the dew, which they receive for a week, takes off more of their impurity ; they are then put into a kind of wooden tubs, or pans, with a hot ley over them, and afterwards boiled with potash, kelp, or barilla. Thus lixiviated, they are again purged in the mill, laid afresh on the ground, and after about a week more passed through a second ley, and all things re-

peated, till such time as they have acquired their just degree of whiteness.

The process of bleaching, not only linens and cottons, but rags for paper, with oxymuriatic acid, or rather with solutions of *oxymuriate of potash*, or *oxymuriate of lime*, has now been generally adopted; and with the use of these, linens can be made as white in six days, as formerly they were in six weeks.

DYEING, the art of staining cloth and other articles of different colours, is of great antiquity, as appears from the traces of it in the oldest, sacred as well as profane, writers. The honour of the invention is attributed to the Tyrians; though what lessens the merit of it is, that it is said to have owed its origin to chance. The juices of certain fruits, leaves, &c. accidentally crushed, are supposed to have furnished the first hint. Pliny assures us, that even in his time the Gauls made use of no other dyes: it is added, that coloured earth and minerals, washed and soaked in rain, gave the next dyeing materials. But purple, an animal juice, found in a shell fish, *purpura*, seems from history to have been prior to any of them. This, indeed, was reserved for the use of kings and princes; private persons were forbidden by law to wear any of it. The discovery of its tingeing quality is said to have been taken from a dog, which, having caught one of the purple fishes among the rocks, and eaten it up, stained his mouth and beard with the precious liquor; this struck the fancy of a Tyrian nymph so strongly, that she refused her lover Hercules any favours, till he had brought her a mantle of the same fine colour.

The people of this country were acquainted with the art of dyeing wool, yarn, and cloth of different colours, at a very early period; the art of dyeing *scarlet* by an insect of the kermes, or cochineal kind, is said however not to have been discovered before the year 1000 of the Christian era. In the sixteenth century, the use of *logwood* was prohibited by statutes in this country, as being discreditable and deceitful; but in 1661 these silly prohibitions were repealed.

Of the great variety of known dyes, few only can be applied to animal or vegetable fibre, without any other preparation than that of cleansing the stuff, and immersing it in a decoction or infusion of the dye. And hence it is necessary to render most colours permanent, that the article to be dyed should be previously impregnated with what has been termed a *mordant*, generally a salt having an alkaline, earthy, or metallic base: thus alum, sulphate of lime, muriate of tin, sulphate of iron, tannin, and oil, are mordants, according to the dyes, and to the substances to which they are to be applied. When the dye imparts to cloth a permanent colour, without the intervention of a mordant, it is called a *substantive* colour; when it requires a mordant to impart a permanent colour, it is called an *adjective* colour. *Indigo* is a substantive, *madder* an adjective colour; cochineal is also an adjective colour: for although the red of the cochineal will stain the cloth while it remains immersed in the solution; yet, as soon as it is taken out and washed, this temporary stain will immediately vanish, and the cloth become as white as before. But if the cloth be dipped in a solution of some alkaline or metallic salt, and then immersed in the solution of cochineal for some time, it will come out permanently coloured; nor will the colour ever be discharged, even by washing with soap and water.

The materials for dyeing different colours are many and various.

Some ingredients produce durable colours, which cannot be discharged either by exposure to air, or washing with soap; others, though they may be made to stand the action of soap pretty well, cannot by any means be enabled to resist the action of air. These are distinguished by the different names of *true* and *false*, *permanent* and *fading*, or *substantive* and *adjective* colours; nor is there any method yet discovered of giving the false colours an equal degree of durability with the true ones. A solution of tin in nitro-muriatic acid will give most of the fading colours a high degree of beauty, and some share of durability, though even this is not able to make them equal to the others. The most permanent dyes we have are cochineal and lac for fine reds and scarlets: indigo and woad for blue; and, when mixed in different proportions with cochineal or lac, for purple and violet colours: weld and some other vegetables for yellow: and madder for coarse reds, purples, and blacks. The fading colours are much more numerous. In this class are included brazil-wood, logwood, peach-wood, red-wood, fustic, turmeric root, annotto, archil, &c.

With regard to the mordants used in dyeing, it has been too often customary to mix a quantity of different ones, by which the colour has been generally spoiled. This truth should, therefore, be constantly before us, that, in general, one single mordant will answer for this purpose better than a hundred. A mixture should only be made, where it is necessary to produce the colour desired; and if a dyer proceed in this simple manner, he may not only attain to great perfection in the art from his own experience, without being taught by others, but even make considerable discoveries; as dyeing is at present far from being brought to perfection. The mordants chiefly to be used in dyeing are fixed alkalies; solutions of tin in sulphuric and muriatic acids, and in nitro-muriatic acid; sugar of lead; cream of tartar; alum; sulphuric acid; and solution of iron in the acetous acid. By means of these, almost all kinds of colours may be dyed at an easy rate, and with very little trouble. Observe, the acids, and acid solutions, must be diluted with a considerable quantity of water, before they are used.

General rules for dyeing all colours.—Having well cleansed the substance to be dyed, and made choice of the mordant proper for fixing the colour desired, dissolve it in water, and steep the substance in this solution for twenty-four hours. Then take it out, and without wringing hang it up to dry, but without heat, and for this it will be proper to allow a pretty long time; as the more perfectly the mordant penetrates the cloth, the more durable will the colour be. Having then prepared a coloured solution or decoction, put the cloth into it. The less heat is applied during the time the cloth remains in the dye, the finer the colour will be; but the longer time will be required for completing the operation. If time cannot be spared, so that a strong heat must be applied, it will be necessary to roll the cloth during the time of dyeing, or the colour will be in danger of proving unequal. After the dyeing is completed, rinse the cloth in cold water, but do not wring it strongly; and then hang it up to dry. In this way may be dyed a great variety of colours, on wool, silk, cotton, and linen, without any variation in the process. A solution of tin in the sulphuric acid will produce all degrees of red, from the palest pink or rose colour, to the highest crimson and scarlet; and this, on all the before-mentioned substances, without exception.

Cotton and Linen may be dyed, by means of the before-mentioned solution, of the most beautiful red, crimson, and scarlet colours. The same may be done by a solution of tin in nitro-muriatic acid: but unless the nitrous acid prevail greatly in the mixture, the colours produced by this last will incline more to purple than the former. With solution of tin in muriatic acid they incline remarkably to purple, and are likewise deficient in lustre. The first two solutions therefore are capital ingredients in dying. Latterly, cottons have been dyed a fine and permanent Turkey red by means of madder, but the manipulations are too complex to detail.

The same preparations will also serve for dying all other colours, blue and green excepted. Thus, a piece of cloth prepared with solution of tin in sulphuric acid, if boiled with the decoction of cochineal, will come out of a *scarlet* colour; if with turmeric, weld, fustic, or many of the common yellow flowers, it will come out different degrees of *yellow;* with Brazil-wood, peach-wood, &c., it will give a fine *purplish crimson;* with log-wood, a fine *deep purple*, &c.: and by combining these in different ways, an infinity of different shades may be produced.

Green Colours are to be produced only by a mixture of blue and yellow: no ingredient being yet discovered, that will, by itself, produce a good green dye. It is usual first to dye the cloth blue with indigo, and then yellow with any yellow-colouring ingredient, by which means a green colour is produced. Cloth and silk may be dyed green with indigo; but they must first be boiled in yellow dye, and then in blue.

Black colours are dyed by preparing the cloth with any solution of iron, but that in the acetous acid is the best; and then boiling it in a decoction of any astringent vegetable. Those chiefly made use of for the purpose are galls, sumach, logwood, and madder. Of these the last is most durable; though galls will also produce a pretty lasting colour, if properly managed. Logwood dyes a very pretty, but fading, black colour. It appears, however, by an experiment made by Mr. Clegg, that by a proper preparation of the cloth with fixed alkaline salts, black colours dyed with logwood might be improved, both as to beauty and durability. The finest blacks are first dyed blue, with indigo; and afterwards black, with a solution of iron, and some astringent vegetable. These are the best methods of producing permanent colours of all kinds. As it is necessary, however, often to give another colour to stuffs which have already been dyed, it is also necessary that a dyer should know how to discharge colours, as well as to make the cloth imbibe them.

Thread is dyed a *bright blue* with braziletto and indigo. *Bright green* is first dyed blue, then black, boiled with braziletto and verditer, and lastly welded. A *dark green* is given like the former, only darkening more before welding. *Lemon* or *pale yellow* is given with weld, and rocou or annotto. *Orange* and *Isabella*, with fustic, weld, and annotto. *Red*, both bright and dark, with flame-colours, &c., are given with brazil, either alone, or with a mixture of annotto. *Violet*, *dry rose*, and *amaranth*, are given with brazil, taken down with indigo. *Fillemot* and *olive colour* are given with galls and copperas, taken down with weld, annotto, or fustic. *Black* is given with galls and sulphate of iron, taken down and finished with braziletto wood.

Tanned Leather, *Skins*, *&c.*, are dyed of a *black* colour by rubbing

them over three or four times with a solution of sulphate of iron, or a solution of iron in the vegetable acids. For leathers that have not been tanned, some galls or other astringents are added to the solution of iron; and in many cases, particularly for the finer parts of leather, and for renewing the blackness, ivory black or lamp black is used. A *blue* colour is given by steeping the subject a day in urine and indigo, then boiling it with alum; or by tempering the indigo with red wine, and washing the skins therewith. *Red* is given by washing the skins and laying them in galls; then wringing them out; dipping them in a liquor made with privet, alum, and verdigris in water; and lastly in a dye made of brazil wood boiled in ley. *Purple* is given by wetting the skins with a solution of roche alum in warm water, and, when dried, with a decoction of logwood in cold water. *Green* is given by smearing the skin with sap green and alum-water boiled; to darken the colour, a little indigo may be added. *Dark green* is also given with steel-filings and sal ammoniac steeped in urine till soft, then smeared over the skin, which is to be dried in the shade. *Sky colour* is given with indigo steeped in boiling water, and the next morning warmed and smeared over the skin. *Yellow* by smearing the skin over with aloes and lintseed oil, dissolved and strained; or by infusing it in weld. *Orange colour* is given by smearing with fustic berries, boiled in alum water; or, for a *deep orange*, with turmeric.

Wood, for inlaying, veneering, &c., is dyed *red* by boiling it in water and alum; then taking it out, adding brazil to the liquor, and giving the wood another boil in it. *Black*, by applying a solution of logwood, boiled in vinegar, hot, with a brush, and afterwards washing the wood over with a decoction of galls and sulphate of iron till it be of the hue required. Any other colour may be given by squeezing out the moisture of horse-dung through a sieve, mixing it with roche alum and gum arabic, and to the whole adding green, blue, or any other colour designed. After standing two or three days, the wood, cut to the thickness of half-a-crown, is put into the liquor boiling hot, and suffered to remain till it is sufficiently coloured. *New mahogany* may be made of a dark colour by smearing it over with a paste made of quick lime and water.

Bone, *Horn*, and *Ivory* are dyed *Black* by steeping brass in aquafortis till it is turned green; with this, the bone, &c. is to be washed once or twice, and then put into a decoction of logwood and warm water. *Green* is begun by boiling the bone, &c. in alum-water; then with verdigris, sal ammoniac, and vinegar, keeping it hot therein till sufficiently green. *Red* is begun by boiling it in alum-water, and finished by decoction in a liquor compounded of quicklime steeped in rain water, strained, to every pint of which an ounce of brazil wood is added: the bone, &c. to be boiled till sufficiently red.

SOAP is a kind of paste, sometimes hard and dry, and sometimes soft, much used in washing, and whitening linens, and for various other purposes, by dyers, perfumers, hatters, fullers, &c. The manufacture of soap in London first began in the year 1524; before that time the city was supplied with white soap from foreign countries, and with gray soap, speckled white, from Bristol, and sold for a penny a pound; and also black soap, for a halfpenny the pound.

Soap is a chemical compound produced by the union of any of the fixed oils with alkalies, earths, or metallic oxides. The alkalies, and

particularly *soda*, are necessary to the production of good soap; and it is also necessary that they should be applied to the oil or tallow in a *caustic* state; to this end when an alkali is dissolved in water, lime is added to the solution to absorb the carbonic acid of the alkali; the liquor deprived of its carbonic acid is called *soap ley;* it is exceedingly caustic and will decompose human flesh. This ley is usually made strong enough to float a new-laid egg. With this ley oil, or tallow, or resin, according to circumstances is *boiled till it unites* into the compound known as soap. The tallow for making soap is reckoned very good if thirteen cwt. of it yield with alkali a ton weight of soap.

White soap of the best quality is made with olive oil and soda; or with tallow and soda, obtained from the *barilla* of commerce.

Yellow soap is made with tallow and yellow resin in the proportion of ten parts tallow and three and a half of resin, these with the addition of the ley, make twenty of soap.

Mottled soap obtains its speckled appearance either by dispersing the ley through it towards the end of the operation, or by adding sulphate of iron, oxide of manganese, or indigo.

Windsor soap is the common white soap scented with oil of caraway seeds or other scent.

Black soap and other *soft soaps* are made from fish oil and a ley of *potash* made in a similar manner as soap ley above, or with inferior tallow and such ley.

Castile soap is sometimes made in this country; and is, we believe, nothing more than common white soap having a solution of sulphate of iron mixed with it in cooling, to give the marbled appearance. But the best *Castile soap* is imported to this country from Marseilles, although it is also brought from Spain. It is most probably composed of olive oil and soda, and sulphate of iron to impart to it the *marbled* appearance.

Soap balls for washing the hands, are made of various colours by simply cutting white soap into small pieces, rolling them in vermilion, blue, or other colour, and squeezing them together into balls; they are scented at the will of the maker.

A cheap soap is sometimes made of woollen rags, &c. and even with the horns of animals instead of oil; but the smell is commonly very disagreeable.

Soap as a medicine (the foreign Castile soap is, for this purpose, considered the best) is generally regarded as purgative, lithontriptic, and tonic; it is also given to counteract the effects of metallic and other poisons; but common white soap is better for such purpose. Soap is also used externally for sprains and bruises; it is an ingredient in the well known soap liniment or *opodeldoc*.

Soap earth, a smooth, unctuous kind of earth, found in the Levant, and used as soap. Soap-earth, Dr. Smith tells us, is only found in two places near Smyrna. It is gathered always before sun-rise, and in the morning, when there falls no dew; so that a stock must be laid up in the summer months, to serve all the year. In some places it comes up an inch or two above the surface of the ground; but the sun rising on it makes it fall again. Every morning there returns a fresh supply.

CANDLES.—Notwithstanding the history of candles is obscure, the trade of a tallow-chandler is certainly ancient, as, in France, previous to the year 1450, the chandlers and grocers formed a united

company; but in that year they were separated into distinct professions. Of the origin of the *trade* we have however no account, but may readily imagine that a dried *rush* dipped in melted tallow, and used at the present time by the farmers in some remote districts of this country, instead of a candle, suggested the more useful and elegant light of the *tallow candle*. There are two sorts of *tallow* candles; *dipped*, and *moulded*. The moulded are the invention of the *Sieur le Brege* of Paris. In making candles, the general method is, after weighing and mixing the tallow in due proportions, to cut it into small pieces, that it may more readily melt. When properly melted and skimmed, a certain quantity of water is poured into it, in order that all remaining impurities may precipitate to the bottom. No water, however, must be thrown into the tallow designed for the *first three dips;* because the wick would imbibe the water, and thus render the candles unfit for burning.—The tallow, thus melted, is poured into a tub, through a coarse sieve of horse-hair, to purify it still more, and may be used after having stood three hours. It will continue fit for use twenty-four hours in summer, and fifteen in winter. The *wicks* are made of spun cotton, several threads of which the tallow-chandlers wind into bottoms or clews; whence they are cut off with an instrument, into pieces a little more than twice the length of the candle; and then put on the sticks for dipping. To make a tallow candle good, there must be an equal quantity of sheep's and bullock's tallow. Lard is always inadmissible. The *wick* ought to be properly twisted, neither too hard nor too loosely, sufficiently dry and pure, otherwise the candle will emit an irregular inconstant flame. Lately machinery has been invented by which the facilities of dipping the wicks have been increased, and the labours of the tallow chandler considerably abridged.

Rush lights have the pith of a rush for a wick instead of cotton; they burn a long time, give a dim light, and do not require snuffing; *small* cotton wicks have lately been substituted for the rush.

Mould candles are so called because made in moulds of brass, pewter, or lead; but pewter is the best. Each candle has its mould. A number of these moulds, having the wick fixed in the middle, are placed in a table or frame, full of holes, and filled with melted tallow. After the moulds have stood long enough to cool, the candles are drawn out; and they are sometimes rendered whiter by hanging them on rods, exposed to the dew and the earliest rays of the sun for several days.

Wax candles.—The *wicks* of wax candles are made of cotton or flax slightly twisted, and covered with white or yellow wax, but chiefly the former, well bleached. Of these candles there are several kinds; some of a *conical* figure, are used in funeral processions, &c. Others are of a *cylindrical* form, used on common occasions. To make wax candles, an iron circle, on which are hung a dozen wicks at equal distances, is suspended over a large basin full of melted wax. A large ladle-full of this wax is poured gently on the tops of the wicks, one after another; and this operation is continued, till the candle arrives at its proper size. The first three ladles must be poured on the top, the fourth, fifth, and sixth, lower down, at certain distances, to give the candle its conical form. The candles are then taken down, and afterward rolled and smoothed upon a walnut-tree table, with a long square instrument of box, smoothed at the bottom. When wax can-

dles are made by the *hand*, they begin to soften the wax by working it in hot water, in a narrow but deep cauldron. A piece of wax is then taken out, and disposed by little and little around the wick. Wax *tapers* are either made as the former, with a ladle, or drawn. The latter are drawn in the manner of wire, by means of two large rollers of wood, turned by a handle, which pass the wick through melted wax contained in a brass basin, and at the same time through the holes of an instrument.

Spermaceti candles are now universally used in theatres, drawing-rooms, &c. as, should any drops fall from them on the clothes of the company, the spermaceti more readily comes off, whereas wax adheres more closely, and cannot be removed without disfiguring the cloth.

Dr. *Franklin* suggested, that the flame of two candles joined would give a much stronger light than both of them separate, which proves to be just. Shoe-makers use a candle on this principle, it having two separate wicks. Candles excluded from the air in bran or flour last, in burning, much longer than those exposed to the air, which sooner makes them rancid. The Roman candles were at first small strings dipped in pitch, or surrounded with wax; though afterward they made them of the papyrus, covered still with wax, and sometimes of rushes, by stripping off the outer rind, and only retaining the pith.

Candle wood, consists of slips of pine about the thickness of a finger, used in New England, and other places, to burn instead of candles, giving a very good light. The French inhabitants of Tortuga use slips of yellow sandal-wood for the same purpose, which yield a clear flame, though of a green colour.

WAX is a yellowish matter, of which the bees form cells for their honey. There are two or three substances, which resemble each other so closely as to have received the name of wax. The first, and by far the most important, is *bees-wax*, which is consumed in such vast quantities for giving light, and is also used for a variety of other purposes. Another kind of wax is the *myrtle-wax*, which is extracted pretty largely in Louisiana, and some other parts of America, from the *myrica cerifera*, or candle-berry myrtle. The next substance, very similar to wax, is the pella of the Chinese, the product of an insect: and the white matter extracted from lac has also a strong resemblance to wax. But although, from the latest researches, wax is not obtained from vegetables exactly as we find it in the combs of this animal, it being elaborated by some peculiar process of the animal itself, and hence may be considered an *animal* product, yet the constituents of wax, with slight modifications, are found in many vegetables: and hence wax may be also considered a vegetable production. The wax, however, obtained from the candle-berry myrtle is much more like hard coloured mutton suet than bees-wax.

A young hive of bees will yield at the end of the season about a pound of wax, and an old hive about twice as much. Wax melts at the temperature of 142° if unbleached, at 155° if bleached. It is bleached by being drawn into thin ribbons, and exposed to the atmosphere or oxymuriatic acid gas. In alkaline ley it forms a kind of soap. The aromatic smell of bees-wax soon dissipates on exposure to the air. The myrtle-wax is a pale green, and melts at 109°. See page 33.

SEALING-WAX may be made very good of the following materials:—Shell lac, eight ounces; rectified spirit of wine, two ounces; camphor, half an ounce; Venice turpentine, four ounces; vermilion, two ounces and a half. Dissolve first the camphor in the spirits of wine, next the shell lac, then add the Venice turpentine, and lastly the vermilion. A careful application of heat is absolutely necessary, or the mass will take fire. An inferior wax may be made by adding yellow resin, and taking away a portion of the shell lac. *Black* wax may be made by merely substituting lamp-black for vermilion.

STARCH is obtained from innumerable vegetable substances; but the starch of commerce is separated from wheat by steeping the grain in cold water till it becomes soft, then putting it in coarse bags, which are pressed into vats of water; a milky juice exudes, and the starch falls to the bottom of the vat. The deposited starch is collected, and dried in a moderate heat; when dried, it splits into the columns or fragments in which it is usually sold. A little smalt or indigo is added to it to give it a blue tinge. Starch is used to stiffen linen, and for various other purposes. Made into a fine powder, it is used as *powder for the hair.* It is the nutritive part of most grains or roots, and may be extracted in considerable quantities from potatoes, and other roots. Vegetables indeed are esteemed nutritious in proportion to the quantity of this matter and gluten which they contain. *Arrow-root*, *tapioca*, and *sago*, are principally, if not entirely, starch. See page 30.

PAPER, sheets of a thin matter, made of some vegetable substance, used principally for writing and printing. The materials, on which mankind have, in different ages, contrived to write their sentiments, have been extremely varied. In the first ages they made use of stones, and tables of wood, wax, ivory, &c. At a more advanced period, skins were employed; and latterly, paper. The different kinds of paper, and materials employed in making them, are reducible to the following: *Egyptian paper*, made of the rush *papyrus*, (the paper used by the Greeks and Romans was made of this plant, and hence the origin of the term *paper*;) *bark paper*, made of the inner rind of several trees; *cotton paper*, made of cotton wool; *incombustible paper*, made of asbestos; and *European paper*, made of linen rags. It appears that paper made from *cotton* was used as early as the ninth century. There are several Greek MSS. on such paper. The most ancient MS. on cotton paper, with a date, in the library of the King of France, was written in 1050.

Linen or *European paper* was first introduced towards the beginning of the thirteenth century; but by whom this valuable commodity was invented is not known. *The method of making paper of linen*, *cotton*, or *hempen rags*, is as follows:—the rags are first placed in a machine formed of wire, which is made to turn round with great velocity to whirl out the dust; they are then sorted according to their different qualities; after which they are put into a trough perforated with holes, defended by wire gratings, through which constantly flows a stream of clear water. In this trough is placed a cylinder, set thick with rows of iron spikes; at the bottom of the trough are fixed corresponding spikes. The cylinder is made to whirl round with great rapidity, so that the cloth is torn to atoms, and with the aid of the water reduced to a thin pulp. By the same process, all the impurities are removed, and the pulp becomes perfectly white. The pulp being thus pro-

perly prepared is carried to a vat, called the *priming vat*, and mixed with a proper quantity of water. The vat is rightly primed when the liquor has such a proportion of the pulp, as that the mould, on being dipped into it, will just take up enough to make a sheet of paper of the thickness required. The mould is a kind of sieve, exactly of the size of the paper to be made, and about an inch deep, the bottom being formed of fine brass wire, guarded underneath with sticks, to prevent its bagging down, and keep it horizontal; and further to strengthen the bottom, there are large wires, placed in parallel lines, at equal distances, which form those lines often visible in white paper when held up to the light: the mark of the paper is also made in this bottom, by interweaving a large wire in any particular form. This mould the maker dips into the liquor, and gives it a shake as he takes it out, to clear the water from the pulp. He then slides the mould along a groove to the coucher, who turns out the sheet upon a felt or woollen cloth, lays another cloth on it, and returns the mould to the maker, who by this time has prepared a second sheet in another mould: and thus they proceed, laying alternately a sheet and a felt, till they have made six quires of paper, which is called a post; and this they do with such swiftness, that in many sorts of paper two men make twenty posts or more in a day. A post of paper being made, it is placed under a press, and all the water squeezed from it; after which it is separated sheet by sheet from the felts, and laid regularly one sheet upon another; and having undergone a second pressing, it is hung up to dry. When sufficiently dried, it is rubbed smooth with the hands, and laid by to be sized. The size is made by boiling shreds and parings of the tanner, currier, or parchment maker; and after mixing it with a certain quantity of alum, in a large tub, they dip as much paper at once as they can conveniently hold, and with a quick motion give every sheet its share of the size, which must be as hot as the hand can well bear; the superfluous size is then pressed out of the paper, which is afterwards hung up sheet by sheet to dry, and being taken down, is sorted, and what is only fit for outside quires laid by themselves; it is told into quires, which are folded and pressed. The broken sheets are commonly put together, and two of the worst quires are placed on the outside of every ream or bundle; and being tied up in wrappers made of the settling of the vat, it is fit for sale. Every common quire of paper contains *twenty-four* sheets; that for *printing*, *twenty-five* sheets. Each ream contains twenty quires.

Paper is of various kinds, and used for various purposes: with regard to colour, it is principally distinguished into white, blue, and brown; and with regard to its dimensions, into atlas, elephant, imperial, super-royal, royal, medium, demy, crown, post, foolscap, pot-paper, &c. *Wove paper* is made in moulds, the wires of which are so fine that the marks of them are scarcely visible. *Blotting-paper* is made of woollen rags and without size. *Pasteboard* is made in a similar way to that of paper; when it is wanted very thick, it is made by pasting the sheets one upon another. *Mill-board* used for covers of books, is made at once of very coarse rags, or old ropes, &c.; of which also *brown paper* is made. Besides paper from these materials, it is also occasionally made from straw: a Mr. Koop in 1820, obtained a patent for straw paper. In the Maldive islands, the natives are said to write on the leaves of a tree called *macarequean*, which are a fa-

thom and a half long, and a foot broad: and in divers parts of the East Indies the leaves of the *musa paradisiaca*, or *plantain-tree*, dried in the sun, served the same use, till of late the French taught them the use of European paper.

The process of paper-making takes about three weeks. The greatest modern improvement in paper-making is the bleaching of the rags; this is done by different methods: one of the best consists of an air-tight chamber in which the rags are placed; a mixture of manganese, sea salt, and sulphuric acid being heated in proper retorts to a certain extent, a gas is disengaged which destroys all the colour which the rags contain.

The machinery for fabricating the paper from the pulp has been simplified so that an immense saving of labour has been thus obtained.

Another improvement in the manufacture of paper has been made in the United States of North America by Messrs. GILPIN and Co., who have invented a machine by which paper of *any length*, in one continued succession of fine or coarse materials, may be produced.

Egyptian paper is that which was principally used among the ancients; made of a rush called *papyrus*, or *biblus*, growing chiefly in Egypt about the banks of the Nile; though it was also found in India; and Pliny describes the *papyrus* or *paper rush* as having a root of the thickness of a man's arm, and ten cubits long; from this arise a great number of triangular stalks, six or seven cubits high, each thick enough to be easily spanned. Its leaves are long like those of the bulrush; its flowers staminous, ranged in clusters at the extremities of the stalks; its roots woody and knotted like those of rushes, and its taste and smell near to those of the cyprus. The moderns have arranged the *papyrus* under the genus *cyperus* or cyper-grass, and thus designate it: *cyperus papyrus* or paper rush, having a three-sided naked culm, umbel longer than the involucres; involucels three-leaved, setaceous; spikelets in threes: a native of Ethiopia and Egypt. This tribe of plants contains numerous species, many of which have fragrant roots.

Marbled paper is paper stained so as to appear in variegated colours like marble. The operation of marbling is thus performed: gum is first dissolved in a trough, into which they plunge each sheet of paper; this done, and all the colours ranged on the table, where also the trough is placed, they begin by dipping a brush of hog's hair into any colour, commonly the blue first, and sprinkle it on the surface of the liquor. The red is next applied in the like manner, but with another pencil; after this, the yellow, and lastly, the green. When all the colours are thus floating on the liquor, to produce that agreeable marbling which we admire, the floating colours are curled and otherwise tastefully varied with a pointed stick: to these the surface of the paper is applied.

Ivory paper is a paper lately invented by Mr. EINSLIE to be used instead of ivory for drawing, and miniature painting, and is said to be superior to ivory itself. The process is described in the thirty-seventh volume of the *Transactions of the Society of Arts*. It consists in the preparation of a size from the cuttings of parchment, uniting, by a similar size, several sheets of drawing paper and afterwards covering it with the size, having previously mixed with it some plaster of

Paris in fine powder. Plaster of Paris gives a *white;* but oxide of zinc, mixed in proper proportions gives a tint nearly resembling ivory.

POUNCE ; a term applied to different substances. A small quantity of charcoal dust inclosed in some open stuff, to be passed over holes pricked in a work, in order to make the lines or designs on a paper underneath, is called pounce. Pounce is used by embroiderers to transfer their patterns upon their stuffs, and also by lace-makers. Formerly, when the manufacture was not brought to its present perfection, writing paper was apt to let the ink sink in and spread. To prevent this it was *pounced* over in a similar way with powder of gum sandarach, to which also the name of pounce is given ; as well as indeed sometimes to common yellow resin in powder, which is occasionally used as pounce for parchment, &c.

END OF THE SECOND PART.

PART III.

OF CIVIL POLITY.

BEFORE we proceed to explain the different *titles* and *distinctions* amongst mankind, it will be extremely proper that the young student should become acquainted, in some degree at least, with

HERALDRY,

The art which teaches the knowledge of those marks of honour, commonly called *coats of arms.* Its chief use consists in explaining the several distinctions established among mankind, in enabling us to pay a proper respect to persons of rank and quality, in assisting us to trace the genealogies of families, and in exciting gentlemen to imitate the virtues of their ancestors. Guillim says that arms were formerly *symbola,* they being marks or badges given to the soldiers by their commanders, to distinguish them as well among themselves, as from their enemies. But whatever gave rise to these devices, it is certain that they were the origin of coats of arms. Being formerly used as above mentioned, in the course of time they came to be bestowed upon persons as badges of honour for signal services done to their country. There can be no doubt, therefore, that *arms* were so named from the devices which martial men used to have painted or engraved upon their shields, &c. The antiquity of these devices is very remarkable, there being scarcely a nation in the world, but in very remote times appropriated something of this kind to themselves, by which they were distinguished from all other people.

Thus the Israelites chose the Hebrew letter *Tau;* the Scythians a *thunderbolt;* the Egyptians an *ox;* the Phrygians a *swine;* the Thracians, *Mars;* the Romans an *eagle;* the Persians, a *bow* and *arrows;* the Goths a *bear,* &c. At the siege of Troy we learn from Homer, that the heroes had their respective devices upon their shields; the shield of Achilles being beautifully adorned with various figures; and that of Agamemnon having on it a lion with this motto in Greek: "This is the terror of men, and he who bears it is Agamemnon." Amphiaraus likewise, we are informed, in his expedition to Thebes, had for his arms a painted dragon; and Capaneus, one of the seven captains that besieged the city, bore the many-headed hydra. The common soldiers, as observed above, had these devices given them

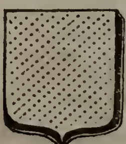
by their commanders; but emperors, generals, captains, and other officers, are supposed to have chosen such bearings for themselves as best suited their rank, or else were thought to resemble some virtue, quality, or character, of which they were particularly fond.

This is the most probable account of the origin and use of arms in the early ages of the world. During the imperial government of Theodosius, and in the time of Charles the Great, heraldry was much improved, and the emblazonment of escutcheons became much more frequent than formerly. At first they were confined to the camp, and were the peculiar privilege of military men; in process of time they were bestowed upon persons of learning and merit of all kinds. This method of rewarding merit is ascribed to Charles IV.; who, conceiving that the services of good ministers and able counsellors were of no less importance to the state than military commanders, conferred a coat of arms upon Bartholus, a great civilian, who is supposed to have been the first of the profession to whom this honourable distinction was ever awarded. The example of this emperor has been since followed by most civilized princes in the world, good subjects having been frequently dignified with coats of arms. To those, therefore, who are interested in the distinctions among mankind, heraldry becomes in some sort a necessary study. The art consists in *blazoning* and *marshalling* coats of arms. The word *blazoning* is derived from the French, *emblazoner*, and signifies displaying or explaining the several emblems and colours of an *achievement* in proper terms; and by *marshalling* is understood the joining divers arms in one shield.

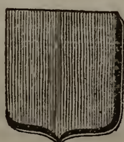
The essential and integral parts of arms are the *escutcheon*, the *tinctures*, or colours, the *charges*, and the *ornaments*.

The shield or *escutcheon* is the field or ground whereon are represented the figures that make up a coat of arms. Shields are of different forms, varying with the times and the nations who used them.

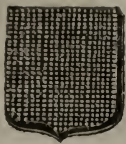
The *tinctures* or colours mean that variety of hue of arms, common both to shields and their charges: the colours generally used, are *yellow*, *white*, *red*, *blue*, *sable*, *vert*, *purpure*; *or*, *gold* or *yellow*, is expressed in the shield, by dots; *argent*, *silver* or *white*, is plain; *gules*, or *red*, by perpendicular lines; *azure*, or *blue*, by horizontal lines; *sable*, or *black*, by perpendicular and horizontal lines crossing each other; *vert*, or *green*, by diagonal lines from the dexter chief to the sinister base point; *purpure*, or *purple*, by diagonal lines from the sinitter chief to the dexter base point.


Or.


Argent.


Gules.


Azure.



Sable.

Vert.

Purpure.

Furs are different kinds, and represent the hairy skins of certain animals prepared for lining robes of state; they are used also in coats of arms. *Ermine* is black spots on a white field; *Ermines* is a field black with white spots; *Erminois* is a field gold with black spots; *Vair* is white and blue, represented by figures of small escutcheons arranged in a line so that the base argent is opposite to the base azure; *potent* is a cross, each end of which terminates in something like a crutch head.

Ermine.

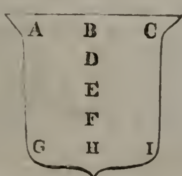
Vair.

Potent.

The *Charges* are whatsoever bearings or figures are borne in the field of a coat of arms; *Rampant* signifies the lion standing erect on one of the hind legs; *Rampant-gardant* the same, looking full faced; *Rampant-regardant*, the same, looking back towards his tail; *Passant* the same, walking; *Sejant* the same, sitting. *Salient* the same, leaping; *Couchant* the same, lying down with the head erect; *Passent-gardant*, the same, walking and looking full faced; *Couped*, cut off smooth and even; *Erased*, torn or plucked off; *Demy*, the half of any charge; *Dormant*, sleeping.

Points of the Escutcheon.

A. *Dexter chief.*
B. *Middle chief.*
C. *Sinister chief.*
D. *Honour point.*



E. *Fess point.*
F. *Nombril point.*
G. *Dexter base.*
H. *Middle base.*
I. *Sinister base.*

Of the *ornaments of Escutcheons* the following are the chief. *Crowns*, such as are usually worn on state occasions by kings; *Coronets*, worn by princes of the blood royal and the nobility; *Mitres*, by bishops;

chapeaux, *wreaths*, and *crest*; this last being the highest part of the ornaments of a coat of arms; the *scroll*, usually placed below the crest, contains a motto alluding to some virtue or quality in the persons to whom the arms belong; the *supporters* are figures, commonly of some animals, standing on a scroll, and placed at the sides of the Escutcheon.

A few other particulars relative to Heraldry may also here be noted.

CROWNS are of different kinds; they are usually assigned to sovereign princes, emperors, and kings.

The crown of the *King of Great Britain* is a circle of gold bordered with ermine, enriched with pearls and precious stones, and heightened up with four crosses-pattee, and four large *fleurs-de-lis* alternately; from these rise four arched diadems adorned with pearls, which close under a mound surmounted by a cross like those at bottom.

The pope has a tiara or long cap of golden cloth inclosed by the marquis's coronet, so that it is a sort of *triple* crown; hence the *triple crown* is sometimes used as a figure to denote the Popedom.

CORONETS are ornamented caps worn on state and other solemn occasions, by *Princes* of the *Blood Royal* and the *Nobility*.

The *Coronet* of the *Prince of Wales* was anciently a circle of gold, set round with four crosses-pattee and as many fleurs-de-lis alternately; but since the restoration it has been closed with one arch only, adorned with pearls, and surmounted by a mound and cross, and bordered with ermine like the king's. Besides this coronet, the Prince of Wales has another distinguishing mark, namely, a plume of three ostrich feathers with an ancient coronet of a prince of Wales; beneath it, in a scroll, is the motto *Ich dien*, I serve. This device was first taken by Edward, Prince of Wales, the Black Prince, after the battle of Cressy in 1346, where, having with his own hand killed the king of Bohemia, he took from his head such a plume, and put it on his own.

The *coronets* of all the immediate *sons and brothers of the kings of Great Britain*, consist of a circle of gold bordered with ermine, heightened up with four *fleurs-de-lis* and as many crosses-pattee, alternate.

The *coronet* of the *Princesses of Great Britain*, is a circle of gold bordered with ermine, and heightened up with crosses-pattee, *fleurs-de-lis*, and strawberry leaves alternate.

The *coronet* of a *Duke* is a circle of gold bordered with ermine, enriched with precious stones and pearls, and set round with eight large strawberry leaves; that of a *Marquis* is circled with gold and bordered as the duke's, but set round with only four strawberry leaves,

and as many pearls on pyramidal points of equal height, alternate; that of an *Earl* is circled and bordered as the preceding, but heightened up with eight pyramidal points or rays, on the tops of which are as many large pearls placed alternately with as many strawberry leaves, the pearls much higher than the leaves; a *Viscount's* coronet differs from the preceding ones in being only a gold circle bordered with ermine with large pearls set close together on the rim; the number of the pearls not limited; the *Baron's* coronet, which was granted by Charles II., consists of six pearls set at equal distances on a gold circle bordered with ermine.

Duke.

Marquis.

Earl.

Viscount.

Baron.

The eldest sons of peers above the degree of a baron bear their father's arms and supporters with a label, and use the coronet appertaining to their father's second title; all the younger sons bear their arms with proper differences, but use no coronets.

Mitres. The archbishops and bishops of England and Ireland place a mitre over their coat of arms. The archbishop's mitre issues out of a ducal coronet: no mitre but an archbishop's is borne upon a ducal coronet, except that of the Bishop of Durham, whose see is a principality.

Archbishop's Mitre. Bishop's Mitre.

Funeral Escutcheons, or *Achievements*, vulgarly called *Hatchments*, are usually affixed to the fronts of houses, when any of the nobility or gentry die, to designate the rank of the deceased, and al-

so whether married, bachelor, or widower, with the degrees also belonging to females.

Husband. *Wife.* *Bachelor.* *Widower.* *Widow.*

1. *Bachelor.* The arms single or quartered, but never impaled; a crest on the hatchment; the ground without the escutcheon black. 2. *Single woman.* Her arms are placed in a lozenge or rhombus, single or quartered, with the ground black and a shell instead of a crest. Ensigned on the hearse with a knot of ribbons. 3. *Married man.* His wife's arms are impaled with his own, with the ground black on his side of the hatchment, and white on his wife's side, to distinguish the dead from the living. 4. *Wife.* Her arms as before, the ground on her side black, and white on her husband's; a shell instead of a crest. 5. *Widower.* His arms are impaled with those of his wife, ground all black and a crest. 6. *Widow.* Her arms are impaled with her husband's within a lozenge-shield, ground all black, a shell instead of a crest. 7. When the deceased is the last of the family, instead of a crest or shell, a death's head is used, denoting the empire of the king of terrors. The small shields, placed on the foreheads of horses drawing the hearses, are called *chaperonies.*

Helmets are important distinctions on escutcheons; they consist of four, viz., for the king, the nobility, a knight, an esquire.

King. *Nobility.* *Knight.* *Esquire.*

A *baronet's* shield is distinguished by an open hand in some part of the *chief.*

In order to exhibit a complete coat of arms, with supporters, coronet, &c. the royal arms of the United Kingdom are annexed.

These are the principal points in heraldry which we can notice; those who desire more minute information will, of course, consult the books written professedly on the subject. It ought to be mentioned, however, in conclusion, that there is in London a college called the *Heralds' College*, consisting of a variety of officers, by whom all affairs relating to heraldry are regulated. At the head of this college is the Duke of Norfolk, who is Hereditary Earl Marshal of England.

Titles and Distinctions.

A TITLE is an appellation of dignity, honour, or pre-eminence. The King of England had the title of King of Great Britain, France, and Ireland; but since the Union with Ireland, his title is simply King of the United Kingdom of Great Britain and Ireland. The King of France has the title of King of France and Navarre: the King of Spain, a whole page of titles, to express the several kingdoms and territories of which he was master: his Majesty of Sweden, King of the Swedes and Goths: his Danish Majesty, King of Denmark and Norway (and England!). The Pope has the title of Holiness; a Cardinal Prince of the Blood, that of Royal Highness or Most Serene Highness; other cardinals, Most Eminent Highness or simply Eminence; an archbishop, Grace, or Most Reverend Father in God; a bishop, Right Reverend Father in God; abbots and priests, Reverend. To emperors is given the title of Imperial Majesty; to kings, Majesty; the King of France, Most Christian Majesty; the King of Spain, Catholic Majesty; the King of Portugal, Most Faithful Majesty; the King of England, Defender of the Faith; the Turk, Grand Seignor, Sultan, and Highness; the Prince of Wales and all the other princes, children of the King of this country, Royal Highness; the Dauphin of France is styled Serene Highness; the Doge of Venice, Most Serene Prince; an elector of the German empire, Electoral Highness; a nuncio or ambassador, Excellency. The Emperor of China, among his titles, takes that of Tien Su, Son of Heaven. The Orientals are exceedingly fond of titles: the simple governor of Schiras, for instance, after a pompous enumeration of qualities, lordships, &c., adds the titles of Flower of Courtesy, Nutmeg of Consolation, and Rose of Delight.

The females in regard to titles generally are addressed in the same style as their husbands; but in this country there is a remarkable exception in regard to the ladies of archbishops and bishops; although their husbands are addressed, the archbishops as *your Grace*, and the bishops as *my Lord*, yet their ladies acquire no title by their husbands'

elevation; being addressed simply as Mrs. King, or Mrs. Sutton, as the case may be; yet the wife of the Lord Mayor of London is addressed as Lady Mayoress and your Ladyship.

The titles of duke, earl, &c., are conferred on persons from their interest or influence with the king or his ministers; and sometimes they are bestowed for services done to the state; as to admirals, generals, great statesmen, and men learned in the law. The lord chancellor is now always made a peer.

EMPEROR, among the ancient Romans, signified a general of an army, who for some extraordinary success had been complimented with this appellation. It came afterward to denote an absolute monarch, or a supreme commander of an empire. The title, emperor, cannot add any thing to the rights of sovereignty, but it gives precedence and preeminence above other sovereigns; and as such it raises all those invested with it to the height of all human greatness. The emperors indeed pretend, that the imperial dignity is more eminent than the regal; but the foundation of such prerogative does not appear: for the greatest and most absolute monarchs, as those of Babylon, Persia, Assyria, Egypt, &c., were called by the names of kings in all languages, ancient and modern. In the East, the title and quality of emperor are more frequent than among us; thus the sovereign princes of China, Mogul, Persia, &c., are all emperors. In 1723, the Czar of Muscovy assumed the title of Emperor of Russia. The kings of England had anciently the title of emperors; as appears from a charter of King Edgar. *Ego Edgarus, Anglorum basilicus, omniumque regum insularum oceani quæ Britanniam circumjacent, &c., Imperator et Dominus.* And the crown of England has been long ago declared in parliament to be an imperial crown.—Since the union with Ireland, our parliament has been styled "*Imperial Parliament.*"

KING.—A person in whom the supreme power of government is vested. Camden derives the word from the Saxon. Among the Greeks and Romans kings were priests as well as princes. The title of *king of the Romans* was conferred by a majority of the German electors, and the person bearing it succeeded of course to the imperial crown on the death of the emperor. It was seldom bestowed however during the emperor's life. This title was taken by Buonaparte, the late ruler of France, after the battle of Lodi, in the year 1796; who subsequently bestowed the title on his son. The Hungarians always give the title of king, *rex*, to their sovereign, even if she be a female. The title of *Grace* was first given to our kings about the time of Henry IV.; and that of *Highness* and *Majesty* to Henry VIII. In all public letters, &c. the king styles himself *nos*, we, though till the time of King John he spoke in the singular number.

The king of England takes an oath, at his coronation, to preserve the rights and privileges of the church, the prerogative of the crown, and the laws and customs of the realm. He has the power, by his prerogative alone, of making war or peace, concluding leagues and treaties, &c. He convokes and dissolves parliament; and may refuse his assent to any bill passed by both houses, without giving his reasons for it. But this apparently important prerogative has not been exercised in this country for a long period, other means being usually resorted to, to prevent such an ungracious and generally unpopular step in a monarch. He may increase the number of members of either house at pleasure, by creating new peers, and bestow-

ing privileges on other towns for sending burgesses to parliament. Debts due to him are always to be satisfied in the first place, in case of insolvency. He has custody of the persons and estates of idiots and lunatics; and to him revert all estates, when no heir appears. All bullion, money, &c., found, if the owners be not known, belong to him. So all wrecks, and lands, recovered from the sea, gold and silver mines, &c., are said to be his. He cannot make new laws, or raise taxes, without the consent of parliament. But though in Great Britain, which is a limited monarchy, the power of the king is greatly restrained, this is so far from diminishing his real honour, that it adds much to the respectability of the office.

Of the king's *revenues* some have belonged, time out of mind, to the crown, and some have been granted by parliament, by way of purchase or exchange for such of the king's hereditary revenues, as were found inconvenient to the subject. Another branch of the king's ordinary revenue consists in the profits and rents of the demesne lands of the crown. These demesne lands were originally very large and extensive, comprising divers manors, honours, and lordships; at present they are greatly contracted. The profits arising from his forests are another branch of the revenue; and that which arises from the king's ordinary courts of justice makes another. There are also many others. However, the king's principal revenue consists in the supplies, granted by the commons in parliament.

STADTHOLDER, a title formerly given to the governor or lieutenant of a province in the United Netherlands, particularly that of Holland; where the word has been mostly used. Menage derives the word from *stadt*, state, and *houlder*, holding, *i. e.* lieutenant of the states. The stadtholder was considered as the first member of the republic, and chief of all the courts of justice. Although his functions were not of so much importance as those of the king of England, yet in many respects they approached royalty. The office of stadtholder is very ancient; the counts, not being able to reside in Holland, appointed stadtholders to command in their absence. William I., Prince of Orange, was stadtholder of Holland and Zealand at the time the Dutch shook off the Spanish yoke, which enabled him to contribute greatly to that happy event. This title is now abolished, and that of king assumed in its stead.

SULTAN, or SOLDAN, a title given to the emperor of the Turks. It had its rise under Mahmound. Vattier says the word is Turkish, and signifies *King of Kings*, and was first given to the Turkish princes about 1055. Others will have it to be Persian. It is said, that Mahmound, toward the close of the fourth century of the Mahommedan era or Hegira, went to reduce Kalaf, a governor of a province, who affected the sovereignty; and that Kalaf, when he heard of his coming, went out to meet him, delivered the keys of his fortress, and owned him his *sultan*, that is, his lord or commander. The title pleased Mahmound so well, that he assumed it ever afterwards; and from him it passed to his descendants, and other Mohammedan princes. The highest officer, among the Turks, next to the sultan, is the *grand vizier*, who has the care of the whole empire. He lives in the utmost splendour, and has above two thousand officers and domestics in his palace.

CZAR, or more properly TZAR, is a title assumed by the grand dukes, or emperors of Russia. The first who bore the title of tzar

was Basil, who freed his country from its subjection to the Tartars, about 1470.

DOGE; a chief magistrate in the late republics of Venice and Genoa. The word properly signifies *duke*, being formed from the Latin word *dux*, as *dogate* and *dogado*, from *ducatus*, duchy. The *doge* of Venice was elected for life; at Genoa, only for two years; the title of *serenity*, with which he was addressed, was considered by the Venetians as superior to that of *highness*. The *doge* was the organ of the republic and the chief council. He had, however, little more than the shadow of majesty, all the authority being vested in the republic.

DEY is the title of the sovereign of Algiers, under the protection of the *grand seignior*. The term *dey*, in the Turkish language, signifies an uncle by the mother's side; and the reason of the denomination is this: the Turkish military consider the grand seignior as their father; the republic as their mother, by which they are nourished and maintained; and the *dey*, as the brother of the republic, and consequently the *uncle* of all who are under his dominion. Besides the age, experience, and valour, which are necessary qualifications, he must also be a native Turk, and have made a journey to Mecca. He has neither guards, nor considerable retinue; he presides at the divan, and is most distinguished by the respect and submission which is paid him. Although the dey of Algiers pays a sort of nominal homage to the *Grand Seignior*, he is more frequently the creature of the soldiers, who occasionally depose and destroy him, with very little ceremony.

BEY denotes a governor of a country or town, in the Turkish empire. The Turks write the word *begh*, or *bek*, but pronounce it *bey*; it properly signifies *lord*, but is particularly applied to a *lord of a banner*, or standard, and is the badge of him who commands in a considerable place of some province.

PRINCE implies sometimes a person invested with the supreme command of a state or country, independently of any superior. But it is generally used for a person who is sovereign of his own territories, yet acknowledges some other as his superior, and pays homage to him. Thus, all the princes of Germany were feudatories of the emperor; and, though they were as absolute in their respective principalities as the emperor, himself, yet they were all bound in certain services to him. Du Cange gives a number of instances, to show, that *prince* anciently signified no more than *lord*. Indeed, *princeps* in Latin, whence *prince* in English, originally signifies only the chief, or first.

Prince is a title given also to the issue of princes, or those of the royal family: in which sense, those of France were called *princes of blood*. In England they are called sons and daughters of England: the eldest son is created Prince of Wales; the younger are created dukes or earls with what title the king pleases. To all the king's children belongs the title of *royal highness*. All subjects are to kneel when admitted to kiss their hand; and at table, out of the king's presence, they are served on the knee. The youngest sons and daughters of the king have precedence before all peers and public officers, both ecclesiastical and temporal. The *Prince of Wales* is born Duke of Cornwall, and immediately entitled to all the rights, revenues,

&c., belonging thereto. He is afterwards created *Prince of Wales, Earl of Chester*, &c.

A VICEROY is a governor of a kingdom, who commands therein, in the name and stead of the king, with full and sovereign authority. Sicily and Mexico, as well as Ireland, were formerly governed by Viceroys.

The NOBILITY of the United Kingdom is called the peerage. It consists of five degrees, namely:—*Duke*, *Marquis*, *Earl*, *Viscount*, and *Baron*. The term *nobility* is, in England, restrained to degrees of dignity above that of a baronet. Some refer the *origin* of nobility to the Goths, who, after they had seized a part of Europe, rewarded their captains with titles of honour, and called them *nobles*, *nobiles*, to distinguish them from the common people. In England, nobility is conferred only by the king, and this by patent, in virtue whereof it becomes hereditary. In other countries, there are other ways of acquiring it. Thus, in France, several offices conferred perfect nobility; as all offices of the crown. There were others also, which communicated only a personal nobility, and died with the person; but the revolution of 1789 swept away all these distinctions, some of which, however, were revived by Napoleon Buonaparte, and are now retained by the present king of France. The privileges of the English nobility are very considerable; they are all esteemed as the king's hereditary counsellors, and are privileged from arrests, unless for treason, felony, and breach of the peace. In criminal cases, they are only to be tried by a jury of peers, who are not put to their oath, but their verdict upon their honour suffices. In their absence, they are allowed a proxy to vote for them. Matthæus observes, that *nobility* among the Romans was quite a different thing from what it is among us: for they were those either raised to the magistracy, or descended from magistrates. There was no such thing as nobility by patent. Bartoli says, that doctors, after they had held a professor's chair in a university for twenty years, became *noble*, and entitled to all the rights of *counts*: but this claim was not admitted at court.

PEERS (from the word *pairs*, French, equals) are, in this country, those noblemen who, either by hereditary right or by election, compose, with the Archbishops and bishops, that branch of the legislature usually called the House of Lords. The *House of Lords* and the *House of Peers* are therefore synonymous.

DUKE, a prince without the title or quality of king.—Such were the Dukes of Lorain, and Holstein. There were also two sovereigns who bore the title of Grand Duke; as the Grand Duke of Tuscany, and the Grand Duke of Muscovy, now called the tzar, or emperor. The Emperor of Germany was *Arch-duke* of Austria. *Duke* implies also a title of nobility, the next below a prince. It is a Roman dignity: the first dukes (*duces*) were commanders of armies. Under the the latter emperors, the governors of provinces were entitled *duces*. The first governor under the name of duke was that of the Grisons. The Goths and Vandals, upon their overrunning the provinces of the Western Empire, abolished the Roman dignities wherever they settled. But the Franks and others, to please the Gauls, who had been long used to that form of government, divided all Gaul into duchies and counties, and gave the titles, sometimes of dukes, and sometimes of counts (*comites*), to the governors thereof. In England, during the time of the Saxons, the officers and com-

manders of armies were called *dukes*, after the manner of the ancient Romans. After the Conquest the title lay dormant, till the reign of Edward III., who created his son Edward, the Black Prince, Duke of Cornwall. Afterwards more were made, whose titles descended to their posterity. The dukes of our days retain nothing of their ancient splendour but the coronet on their escutcheon, the only mark of their departed sovereignty. They are created by patent, cincture of the sword, mantle of state, imposition of a cap, and coronet of gold on the head, and a verge of gold in their hand. The eldest sons of dukes are, by the courtesy of England, styled *marquises* or *earls*, according to the titles enjoyed by their parents, next below that of *duke*, and the younger sons *lords*. A duke has the title of *grace;* and being written to, is styled, in the herald's language, the most noble. Dukes of the blood royal are styled most high, most mighty, and illustrious princes.

MARQUIS is a title of nobility the next below a duke. Opinions differ as to the creation of this title. Some suppose it comes from the Marcomanni, an ancient people, who inhabited the *marches* of Brandenburg. Marquises were anciently governors of frontier cities or provinces, called marches. Marquis is originally a French style: the Romans were unacquainted with it. King Richard II. was the first who introduced the dignity of marquis among us. All the sons of marquises are styled, by courtesy, lords; the *eldest* son of a marquis takes, by courtesy also, the second title of his father.

EARL is a title of nobility, the next below a marquis, and above a viscount. Earls were anciently attendants or associates of the king in his councils and martial expeditions; such as *comites* (counts) were of the magistrates of Rome, in quality of deputies, to execute their offices for them. Hence also earls are called in Latin, *comites;* in French, *comtes*, &c. The Germans call them *grafen;* the Saxons, *ealdermen;* the Danes, *eorlas*. Originally the title earl always died with the man. William the Conqueror first made it hereditary; giving it in fee to his nobles; and annexing it to this or that shire, or county. For the support of the earl's state, he allotted the third penny out of the sheriff's court, issuing out of all pleas of the shire from which the earl took his title. Earls are now created by charter, without any authority over, or particular relation to, their counties; and without any profit arising thence, except some annual stipend out of the exchequer for the honour of it. The number of earls being of late much increased, and no more counties being left for them, several of them have made choice of some eminent part of a county, as Lindsey, Holland, Craven, &c.; others of some city, as Exeter, Bristol, &c.; and others, of some village, or their own seat, park, &c., as Godolphin, Bolton, Danby, Wharton, &c. Two earls we have, who are not local, *i. e.* not dignified from any places, but from noble families, *viz.* Earl Rivers, and Earl Poulet. A third is denominated from his office, *viz.* Earl Marshal. Earls are created by cincture of sword, mantle, a cap and a coronet put on the head, and a charter in the hand. They are styled by the king *consanguinei nostri*, our cousins. Their title is, noble earl. Their coronet has the pearls raised on points, with leaves between. Earl was a great title among the Saxons: it is observed to be the most ancient of any of the peerage; and that there is no other title of honour in use among the present nobility, which was likewise used among the Saxons, beside it. The

wife of an earl is called a *countess.* The eldest son of an earl takes, by courtesy, the second title of his father.

COUNT, *Countee*, *Comes*, a nobleman who possesses a domain erected into a county. English, Irish, and Scottish counts, we distinguish by the title of *earls;* foreign ones still retain the name. Anciently all generals, counsellors, judges, secretaries of cities, under Charlemagne, were called counts; the distinguishing character of a duke and count being this, that the latter had but one town under him, but the former, several. In the times of the commonwealth, *comites*, among the Romans, was a general name for all those who accompanied the proconsuls and propraetors into the provinces, there to serve the commonwealth.—Under the emperors, *comites* were officers of the palace. The origin of what we now call counts seems owing to Augustus, who took several senators to be his *comites*, to accompany him in his voyages and travels, and assist him in hearing causes, which were there judged with the same authority as in full senate. These counsellors of the emperor were really counts, *comites*, companions of the prince; and sometimes took the title, but always with the addition of the emperor's name whom they accompanied: so that it was rather a mark of their office, than a title of dignity. Constantine was the first who converted it into a dignity; and under him it was, that the name was first given absolutely. Under the last of the second race of French kings, this dignity was made hereditary.

VISCOUNT is a title of nobility next below an earl, and above a baron. It is supposed to have been introduced into England by the Normans.

BARON is the lowest title of nobility in this country. The origin and primary import of the term *baron* have been much contested: some will have that it originally denoted a man; some, a hero, or valiant man; others, a great or rich man.—Menage derives it from the Latin *baro*, which we find used in the pure age of that language for *vir*, a stout or valiant man; whence, according to this author, it was, that those placed next the king in battle, were called *barones*, as being the bravest men in the army; and as princes frequently rewarded the bravery and fidelity of those about them with fees, the word came to be used for any noble person, who held a fee immediately of the king. Barons sometimes have their title from particular places, and sometimes they take them from their name before their elevation to the peerage, as Lord Rodney, Lord Erskine, &c. Barons, in this country, are peers of the realm, and enjoy all the privileges thereof. In ancient records, the word *barons* included all the nobility of England, because, regularly, all noblemen were barons, though they had a higher dignity. And the great council of the nobility, as they consisted of lords and barons, dukes, marquises, &c., were comprehended under the name of *la councel de baronage.*

LORD, a title of honour, given to those who are noble either by birth or creation, and vested with the dignity of a baron. The word is of Saxon origin, and originally signifies *bread-giver;* alluding to the hospitality of our ancient nobles. A *lord of parliament* is usually considered the same as a *peer* of the realm; yet a bishop is a lord of parliament, although not a peer. Lord is also applied to those so called by the courtesy of England; as all the sons of a duke, or marquis, and the eldest son of an earl. The appellation is also given

to persons honourable by office; as lord chief justice, lord chancellor, lord of the treasury, &c.

THANE, the name of an ancient dignity among the English, or Anglo-Saxons. Skene makes *thane* to be a dignity equal with that of the son of an earl. Camden says, they were dignified only by the offices which they bore. Soon after the Conquest, the name was disused, and instead thereof they were called king's barons. Their origin is referred to king Canute, who, taking the chief of the Danish nobility, to the number of 3,000, for his guard, called them *thing-lethe*, from two Danish words, *theign*, or *thein*, body of nobility, and *lith*, order of battle. In old authors also we meet with *thane*, as signifying a nobleman, sometimes a freeman, and sometimes a magistrate.

A BARONET is in dignity next below a baron, and above a knight; he has precedency of all knights, except those of the *garter*. The dignity of baronet is given by patent, and is the lowest degree of honour that is hereditary. The order was founded by king James I., in 1611, who erected it for the purpose of raising money, the title being sold by him. They had several considerable privileges given them. Baronets take place according to the dates of their patents; by the terms of which, no honour is to be erected between barons and baronets. The title, *sir*, is granted to them by a peculiar clause in their patents, though they be not dubbed knights.—But a baronet, and his eldest son, being of full age, may claim knighthood.

A KNIGHT properly signifies a person, who is, by the king, raised above the rank of a gentleman, into a higher class of dignity and honour. The word *knight*, in its original German, *knecht*, signifies a servant; and has since been used for a soldier, or military man.—We have but one instance among us where knight is used in the first sense, and that is, in knight of the shire, who, properly, serves in parliament for a county. In many languages, knight is expressed by a word which signifies a horseman, as being usually employed on horseback. Indeed our common law calls them *milites*, soldiers, because they usually held lands in knight-service, to serve the king as soldiers in his wars; in which sense the word *miles* was used *pro vassalo*. Knighthood was the first degree of honour in the ancient armies, and was conferred, with a great deal of ceremony, on those who had distinguished themselves by some notable exploit in arms. The ceremonies, at the creation of knight, have been various. The principal were, a box on the ear, and a stroke with a sword on the shoulder. Then were put on him a shoulder-belt, gilt sword, spurs, and other military accoutrements; after which, being armed as a knight, he was led in great pomp to the church. Knights grew so very numerous, that the dignity became of much less repute. Charles V. is said to have made five hundred in a single day: on which account, therefore, new orders of knighthood were instituted, in order to distinguish the more deserving from the crowd. Knights, *equites*, among the Romans, were the second degree of nobility, following immediately that of the senators.

Knights-Errant; a pretended order of chivalry, mention of which is made in old romances. They are a kind of heroes, who travelled the world in search of adventures, redressing wrongs, rescuing damsels, and taking all occasions to signalize their prowess. This romantic bravery of the old knights was in former times the chimera of the Spaniards.

Knights of the shire, or *knights of parliament*, are gentlemen of landed property, chosen, on the king's writ, by such of the freeholders of every county as can expend 40*s.* per annum, to represent such county in parliament. These, when every man who had a knight's fee was constrained to be a knight, were, of necessity, to be *milites gladio cincti*, for so the writ runs to this day: but now custom admits esquires to be chosen to this office. They must have at least 600*l.* per annum, and their expenses are to be defrayed by the county, though this is now seldom required.

There were also *knights bachelors*, as being the lowest order of knights, and inferior to bannerets. At present, they are called *equites aurati;* from the gilt spurs that are put on them at the time of creation. The ceremony is exceedingly simple; the king touches the person lightly with a naked sword, and says, *Sois chevalier, au nom de Dieu:* and afterward, *Avance chevalier.*

Knights bannerets were an ancient order of knights, or feudal lords, who, possessing several large fees, led their vassals to battle under their own flag, or banner. They were reputed the next below the nobility. In England, it died with the persons that gained it. The knight banneret was created in the field by cutting off a piece of his banner. The last person made a knight banneret was Sir John Smith, after Edgehill fight, for rescuing the standard of King Charles I.

Knights of the Garter. The order of the garter is military, instituted by King Edward III., in 1350, under the title of the *Sovereign and knights-companions of the most noble order of the garter.* The order consists of twenty-six knights or companions, generally all princes or peers; whereof the king of England is sovereign, or chief. They wear a *garter* set with pearls and precious stones on the left leg, with this motto, *Honi soit qui mal y pense, i. e.* evil be to him who evil thinks: they are a college or corporation, having a great and small seal: their officers are, a prelate, a chancellor, register, king-at-arms, and usher, a dean and twelve canons, with petty canons, vergers, and twenty-six pensioners, or poor knights. The order is under the patronage or protection of St. George of Cappadocia, the tutelar saint of this kingdom. Their college is held in the castle of Windsor, within the chapel of St. George, and the chapterhouse erected by the founder for this purpose. Their robes, &c. are the garter decked with gold and gems, and a buckle of gold, to be worn daily; and at feasts and solemnities, a surcoat, mantle, high velvet cap, collar of SS composed of roses, enamelled, &c. When they wear not their robes, they have a silver star on the left side; and generally bear the picture of St. George, enamelled on gold, and beset with diamonds, at the end of a blue ribbon, crossing the body from the left shoulder. They are not, by the statutes, to appear abroad without the garter, on penalty of 6*s.* 8*d.* paid to the register. The order of the garter is the most ancient and noble lay order in the world. Its origin is somewhat differently related: one account is, that it was erected in honour of a garter of the countess of Salisbury, which she dropped in dancing, and that King Edward picked it up: but some of our antiquaries set this aside as fabulous, stating it to have been instituted on account of the victory obtained over the French at the battle of Cressy: that prince, say some historians, ordered his garter to be displayed as a signal of battle, in commemoration whereof he made a garter the principal ornament of the order erected in me-

mory of this signal victory, and a symbol of the indissoluble union of the knights.

There are also *knights of the bath*, the *thistle*, and the order of *St. Patrick*. The *knights of the bath* are a military order, instituted by Richard II. Their motto is, *Tria juncta in uno*, signifying the three theological virtues. It was, at first, the custom to bathe before the ceremony; but this is now dropped. This order was many years extinct; but revived again under King George I., and is now become the most common honorary reward to distinguished military officers.

Knights of the thistle, or *St. Andrew*, a military order of knighthood in Scotland. The principal ensign is a gold collar, composed of thistles and sprigs of rue, interlinked with annulets of gold, and having pended thereunto the image of St. Andrew, with his cross, and the motto, *Nemo me impune lacessit.*

Knights of the order of St. Patrick were instituted in 1783 at Dublin. The ceremony of the installation was performed at the cathedral church of St. Patrick, where the knights, descending into the middle of the choir, were invested with the sword, the mantle, and the collar. The order is composed of twelve knights.

There is also an inferior kind of knights, who have only the title of *sir* prefixed to their arms, and made by the word of his majesty, from among merchants and professional men, for some service or personal homage paid to the sovereign. These knights are sometimes called *knights of the chamber* or *the carpet*, from the place or thing on which they, kneeling, receive the honour.

SIR is a title applied now only to a *baronet* and to a *knight*, as *Sir Francis Burdett, baronet*, or *Sir Simon le Blanc, knt.;* but it was formerly applied to a Bachelor of Arts, in the University; there, however, it was affixed to the sirname, as *Sir Evans*, hence the title of the character *Sir Hugh Evans* in one of Shakspeare's plays.

ESQUIRE.—This word comes from the French *escu*, and the Latin *scutum*, which signify a shield. An esquire was originally the person, who, attending a knight in the time of war, carried his shield; whence he was called *escuier*, in French, and *scutifer*, *i. e.* shield-bearer, or *armiger*, *i. e.* armour-bearer, in Latin. Hotoman says, that those whom the French call esquires were a military kind of vassals, having *jus scuti*, viz. liberty to wear a shield, and in it the ensigns of their family, in token of their gentility or dignity. But this addition has not, for many years, had any relation to the office of the person to whom it has been attributed. It is now considered merely as a title of dignity, and next in degree to a knight. Officers of the king's court and household, counsellors at law, justices of the peace, are only esquires in reputation; and he who is a justice of the peace has this title only during the time he is in commission, and no longer, if he be not otherwise qualified to wear it. A sheriff of a county, being a superior officer, bears the title of esquire during his life. The chiefs of some ancient families are esquires by prescription; and in late acts of parliament many wealthy persons, commonly reputed to be such, are ranked among the esquires of this kingdom.

GENTLEMAN, a person of good family, or descended of a family which has long borne arms, the grant of which adds gentility to a man's family. In our statutes, *gentilis homo* was adjudged a good addition for a gentleman. We read, that J. Kingston was made a gentleman by King Richard II. If it be asked what constitutes a gentle-

man, the answer is—being entitled to bear arms. And Camden observes, that the distinction of a gentleman of coat armour, or an upstart, and a gentleman of blood, is the bearing arms from the grandfather, and that he who bears arms from his grandfather is properly a gentleman of blood; for which cause it is requisite, by the statutes of the Bath, that every knight, before his admission, should prove himself to be so qualified, which done, it carries with it a passport to the order of the garter. Guillim says, if a gentleman be bound apprentice to a merchant, or trader, he has not thereby lost his gentility; and he desires it may be remembered, for the honour of the trade, that King Henry VIII. thought it no dishonour to him, when he quitted his queen, to take for his wife, Anne, the daughter of a lord-mayor of London. But the word gentleman is a general term, with us, for persons of good education and respectable appearance. The words *gentilhomme*, in French, and the Italian *gentilhuomo*, and the Spanish *hidalgo*, or *hijo dalgo*, imply a person of note or fashion.

MONSEIGNEUR, in the plural *messeigneurs*, a title of honour and respect, formerly used by the French in writing to persons of superior rank or quality. The word is a compound of *mon*, my, and *seigneur*, lord. Dukes, peers, archbishops, and bishops, were complimented with the title *monseigneur*. In the petitions presented to the sovereign courts, they use the term *messeigneurs*. *Monseigneur*, used absolutely, signifies the Dauphin of France.

MONSIEUR, in the plural *messieurs*, a term or title of civility used by the French, in speaking of their equals, or those a little below them; answering to Mr. or Sir, among the English. The word is a compound of *mon*, my, and *sieur*, sir. Pasquier derives *sieur* and *monsieur*, from the Latin *senior*, elder. The Italians say *signor*, and the Spaniards *senor*, in the same sense, and from the same origin. The superscription of all letters began, *A monsieur*, *monsieur* such a one. The use of the word *monsieur* was formerly more extensive. They applied it to people who lived many ages before them: thus, *monsieur* St. Augustine, *monsieur* St. Paul, *monsieur* St. James, &c. *Monsieur* is used absolutely for the eldest brother of the king of France.

SIRE was a title in France, given to the king as a mark of sovereignty; he was thus addressed in epistles and discourses. Sire was anciently used in the same sense with *sieur* and *seigneur*, and applied to barons, gentlemen, and citizens: in English it signifies *father*, but is used as a title only in addressing the king, and then without addition. Sieur, having been a title of honour among the French, the lawyers used to say, I plead for the *sieur* marquis, the *sieur* abbot, &c., for *sieur* often expressed *seigniory*, or *lordship*.

Great Officers of State, Parliament, etc.

A LORD LIEUTENANT *of a county* is generally some man of rank resident in it, and is appointed by the king during the pleasure of the crown. He acts in a military capacity; manages the militia; has the power of commissioning its colonels, majors, captains, and subaltern officers. In case of a rebellion, the Lord Lieutenant marches at the head of the militia, and is himself a colonel. Lord lieutenant is also the name of the civil and military governor of Ireland. His office is similar to a Governor-General in other places.

AMBASSADOR, a public minister, sent from one sovereign prince,

as a representative of his person, to another. The word is said to be derived from the Latin *ambasciator*, formed of *ambactus* an old word borrowed from the Gauls, signifying servant, client, domestic, or officer. In Latin, we usually call this kind of minister, *legatus*, or *orator*; though it is certain the word ambassador, with us, has a much more extensive signification than that of *legatus* among the Romans. At Athens, the ambassadors from foreign princes and states mounted the tribune or pulpit of the public orators, there opened their commission, and acquainted the people with their business and errand: in Rome, they were introduced to the senate, and delivered their commission to them: among us, they make their address in the first instance to the king, but afterward transact business with the minister for foreign affairs. The name of ambassador, Cicero observes, is sacred and inviolable; David, we read, made war with the Ammonites to revenge the injury done to his ambassadors—2 Kings, x. Alexander put the inhabitants of Tyre to the sword, for having insulted his ambassadors; and the youth of Rome, for affronting the ambassadors of Vellona, were delivered up into their hands, to be punished at discretion. The ambassadors of kings should never attend any public assemblies, marriages, interments, or other solemnities, unless their masters have some interest therein; nor must they go into mourning, or the like, on any occasions of their own, by reason they represent the persons of their princes, and must conform their manners and customs to theirs.

A MINISTER OF STATE is one to whom the prince intrusts the administration of his government. The grand vizier is the prime minister of the Ottoman empire. In this country we have many ministers of state. When the office of *First Lord of the Treasury*, and that of the *Chancellor of the Exchequer* are united in the same person, he is called *premier* or *prime minister*; but, whether united or not, the First Lord of the Treasury is always considered the ostensible minister.

The MINISTRY, in England, consists of several persons holding a variety of the chief and important offices in the state: the *First Lord of the Treasury*; the *Lord Chancellor*; the *Lord President of the Council*; *Lord Privy Seal*; the *First Lord of the Admiralty*; the *Secretary of State* for the Home Department; the *Secretary of State* for the Foreign Department; the *Secretary of State* for the Colonies; the *Secretary at War*; the *Commander in Chief of the Army*; the *Chancellor of the Exchequer*; the *Master General of the Board of Ordnance*, &c. &c. compose the ministry.

The CABINET is a select body, consisting of the chief persons in the ministry, on whom more immediately depends the direction of public affairs. A cabinet minister is always a privy-counsellor. The cabinet is commonly composed of all or most of the officers above mentioned; but its construction varies, some officers being in one, who are not in another cabinet. The number of the cabinet also varies; it generally consists of twelve or more persons.

TREASURER, an officer, to whom the treasure of a prince, or corporation, is committed, to be kept, and duly disposed of in payment of officers, and other expenses. In England, the principal officers under this denomination are the treasurer of the household, treasurer of the navy, the wardrobe, the king's chamber, &c. Formerly there was a

Lord High Treasurer of England, who was the third great officer of

the crown. Under his charge and government was kept all the king's revenue in the exchequer. He received the office by delivery of a white staff to him from the king, and held it during the king's pleasure; anciently, he received it by the delivery of the golden keys of the treasury. He had the check of all the officers employed in collecting imposts, customs, tributes, or other revenues of the crown. He had the gift of all the customs', comptrollers', and searchers' places in all the ports of London, and the nomination of escheators in every county. He alone, or others in commission with him, let leases of all the crown lands, &c. Of late years this office has always been executed by *lords commissioners*, usually five in number, called the *Lords of the Treasury*, although it sometimes happens that some of them are not noblemen.

The Treasurer of the Household is an officer, who, in the absence of the lord steward, has power, with the other officers of the green cloth, and the steward of the Marshalsea, to hear and determine treasons, felonies, and other crimes, committed within the king's palace.

The Treasurer of the Navy is an officer, who receives money out of the exchequer, by warrant from the lord high treasurer, or the lords commissioners executing that office, and pays all charges of the navy, by warrant from the principal officers of the navy.

TREASURY, the place wherein the revenues of a prince are received, preserved, disbursed. In England, the treasury is a part of the exchequer, by some called the lower exchequer. The officers of his majesty's treasury, or the lower exchequer, are, a lord treasurer, a chancellor, two secretaries, two chamberlains, an auditor, four tellers, a clerk of the pells, ushers of the receipt, a tally cutter, &c.

At Rome, under the emperors, there were two kinds of treasuries, the one, called *ærarium*, wherein the money destined to support the charges of the government was kept; the other, *fiscus*, wherein was preserved that intended for the particular subsistence of the emperor and his court. In effect, the ærarium belonged to the people, and the fiscus to the prince. We have still a resemblance of this difference among us; but it was long confounded in France, and other countries, where the king disposed absolutely of the public treasure, &c.

The LORD HIGH CHANCELLOR, or KEEPER OF THE GREAT SEAL, is the first person of the realm, next after the king and princes of the blood, in all civil affairs. He is the chief administrator of justice, next to the sovereign, being the judge of the court of chancery. All other judges are confined to the *strict law:* but the chancellor has the king's absolute power to moderate the rigour of the written law; to govern his judgment by equity, and the law of nature and conscience. The offices of lord chancellor and lord keeper of the great seal are, by statute of the 5th of *Eliz.*, made the same thing; though, till that time, they were different. It is the highest honour of the long robe, being created by mere delivery of the king's great seal into his custody, whereby he becomes, without writ or patent, an officer of the greatest weight and power of any subsisting in the kingdom. To him belongs the appointment of all the justices of the peace throughout the kingdom, and he is patron of all the king's livings under the value of 20*l.* per ann. in the king's books, and *Speaker* of the *House of Lords.* He is the general guardian of all infants, id-

iots, and lunatics; and has the general superintendence of all charitable institutions in the kingdom. Finally, he has an extensive jurisdiction, which he exercises, in his judicial capacity, in the court of chancery.

The CHANCELLOR OF THE EXCHEQUER is an officer, supposed, by some, to have been created, for qualifying extremes in the exchequer. He presides in that court, and the exchequer chamber, and takes care of the interest of the crown. He has great authority in managing the royal revenue. He is always in commission with the lord treasurer for letting crown lands, &c.; and has power, with others, to compound for forfeitures on penalty statutes, bonds, and recognizances, entered into by the king.

PRIVY COUNCIL; a council of state, held by the king with his counsellors, to concert matters for the public service, the honour and safety of the realm, &c. The privy council is, or ought to be, the *primum mobile* of the state, and that which gives motion and direction to all the inferior parts. It is likewise a court of justice of great antiquity; the primitive and general way of government in England being by the king and privy council. It has been frequently used by our kings for determining matters of great importance; the ordinary judges have, sometimes, declined giving judgment, till they had consulted the king and privy council; and the parliament have referred matters of high moment to the same, as being, by long experience, better able to judge of, and, by their secresy and expedition, to transact some state affairs, than the lords and commons. At present, the privy council takes cognizance of few or no matters, except such as may not be well determined by the known laws and ordinary courts; such as matters of complaint, and sudden emergencies. The oath of a privy counsellor is, to the utmost of his power and discretion, truly and justly to counsel the king, and keep secret the king's counsels. With the advice of this council, the king issues proclamations that bind the subject, provided they be not contrary to law. In debates, the lowest delivers his opinion first, the king last; and thereby determines the matter. A council is never held without the presence of a secretary of state. Commoners, as well as peers, may be privy counsellors; a privy counsellor is, by virtue of his office, styled *right honourable*.

The LORD PRESIDENT OF THE COUNCIL is the fourth great officer of the crown, and as ancient as the time of King John. His business is to attend on the king, propose business at the council table, and report to the king its several transactions.

PRIVY SEAL; a seal which the king uses, previously to such grants, &c., as afterwards pass the great seal.

The LORD PRIVY SEAL is the fifth great officer of the crown, through whose hands pass charters and grants of the king, and all pardons signed by him, before they come to the great seal; also matters of less moment, which do not pass the great seal, as for payments of money, &c. He is a lord by office, and a member of the privy council. He was anciently chief judge of the court of requests.

LORD CHAMBERLAIN; the sixth great officer of the crown, to whom belong livery and lodging in the king's court; and there are fees due to him from each archbishop or bishop, when they perform their homage to the king; and from all peers at their creation, or doing homage. At the coronation of every king, he is to have forty ells

of crimson velvet for his own robes. This officer, on the coronation day, is to bring the king his clothes. On that day, he carries to the king the sword and scabbard, and the gold that is offered the king, and the royal robes and crown.—He dresses and undresses the king on that day, and waits on him on other occasions. To him likewise belongs the provision of every thing in time of parliament, to which end he has an apartment near the House of Lords. He has the government of the palace of Westminster, and issues out warrants for preparing, fitting out, and furnishing Westminster-hall for coronations. Under his command are the gentleman-usher of the black rod, the yeoman-usher, and door-keepers.

The *Lord Chamberlain of the Household* is an officer who has the direction of all the officers belonging to the king's chamber, and of the wardrobe; as also of all sergeants at arms, the king's chaplains, &c.; and he administers the oath to all above stairs.

The *Lord Steward of the Household* is the chief officer of the king's court; he has the care of the king's house, and authority over all the officers and servants of the household except such as belong to the chapel, the chamber, and the stable.

There is also an officer, occasionally created in this country, called the *Lord High Steward of England*, to officiate at a coronation, at the arraignment of a nobleman for high treason, and the like. During his office he carries a white staff in his hand; the trial, &c. being ended, he breaks the staff, and with it his commission expires.

SPEAKER *of the House of Commons*; a member of the house, elected by a majority of votes, to act as chairman or president, in putting questions, reading briefs or bills, keeping order, reprimanding the refractory, adjourning the house, &c. The first thing done by the commons upon meeting of a new parliament is, to choose a speaker, who must be approved of by the king; and who, upon his admission, begs his majesty, that the commons, during their sitting, may have free access to his majesty, freedom of speech in their own house, and security from arrests. The speaker is not allowed to persuade or dissuade, in passing a bill, but only to make a short and plain narrative; or to vote, unless the house be equally divided.

MARSHAL, or MARESCHAL, primarily denotes an officer who has the care or command of horses.

Earl Marshal of England; one of the great officers of the crown, who takes cognizance of all matters concerning honour and arms, determines contracts relating to deeds of arms out of the realm upon land, and matters concerning war within the realm, which cannot be determined by common law; in which he usually proceeds according to the civil law. This office is hereditary, having been for many ages in the house of Norfolk.

PARLIAMENT; a grand assembly of the two estates of the kingdom, consisting of the *lords spiritual* and *temporal*, and the *commons*, summoned to meet the king, to consult of matters relating to the common weal; and particularly, to enact and repeal laws. The two houses of parliament are the king's grand council. Till the Conquest, the great council, consisting only of the great men of the kingdom, was called *magnatum conventus*, and *prælatorum procerumque concilium*. The Saxons, called it *wittenagemote, i. e.* assembly of the wise. About the beginning of the reign of Edward I., some say in the time of Henry I., it was first called *parlementum, i. e. speechment*, from

the French, *parler*, to speak; though it still consisted only of the barons, or great men of the nation. It was not till the reign of Henry III. according to some, that the commons were called to sit in parliament; the first writs or summons bearing date 49 Henry III., anno 1217: though Sir Walter Raleigh, in his Prerogative of Parliaments, thinks the commons were first called in the 17th of Henry I.; and Dr. Heylin dates their first admission in the reign of Henry II. De Lolme states decidedly, that they were first convened by Edward I., in 1295. Indeed, Sir Edward Coke, Dodderige, Prynn, and others, have shewn, that the Commons of England had, in the earliest times, a share in the legislature, and a place in great assemblies, although not as a distinct house. Parliaments are summoned, prorogued, and dissolved by the king alone; nor can a parliament begin without the king's presence, or that of his commissioners. A parliament is called by the king's writ, directed to the sheriffs of each county, to summon the people to elect two knights for such county, and one or two burgesses for each borough, &c. Anciently all the people had votes in the elections; till it was enacted by Henry VI., that none but freeholders having a yearly revenue of 40*s.*, should be admitted to vote; nor were any to be elected, who were under twenty-one years of age. At first new parliaments were called every year: by degrees their term grew longer. In the time of King Charles II., they were held a long time with great interruptions. Both these methods were attended with such bad consequences, that, in the beginning of the reign of King William, an act was passed restraining the term of parliament to three sessions, or three years; hence called the *triennial act*. The period of a parliament has been since lengthened to *seven years*. The place where the parliament meets is at the pleasure of the king. It has been held for a long time in the palace of Westminster: the lords and commons have distinct apartments. In the lords' house, the princes of the blood sit in distinct seats; the great officers of state, dukes, marquises, and bishops on benches; the viscounts and barons on others across the house; all according to their order of creation, place, &c. The commons sit more promiscuously; yet the *ministers* and those who usually vote with them, sit on the *right* hand of the speaker, the *opposition* on the *left*: the speaker has a chair at the upper end, and the clerk and his assistant have chairs at a table near him. All the members of the House of Commons take certain oaths, and subscribe the opinions against transubstantiation, &c., which test the lords, though they do not take the oaths, are also obliged to take. The House of Lords is the sovereign court of justice of the realm, and the dernier resort; the House of Commons is the grand inquest of the nation.

The HOUSE OF COMMONS meet in a building of an oblong shape, formerly a chapel, known by the name of *St. Stephens*; the House of Lords meet in an apartment, a short distance from the House of Commons; both are connected with and contiguous to Westminster Hall.

The manner of debating, and passing bills in parliament.—Any member may ask leave to bring in a bill, which being granted, that person, with others, is ordered to prepare and bring in the same. When ready, a time is appointed for reading it; after being read by the clerk, the speaker reads the abstract of it, and puts the question, whether or not it shall have a second reading? After a

second reading, the question is, whether or not it shall be committed? which is either to a committee of the whole house, if it be of importance, or to a private committee. The committee being appointed, and a chairman chosen, the chairman reads the bill, paragraph by paragraph, puts every clause to the question, fills up blanks, and makes amendments, according to the opinion of the majority. The bill thus gone through, the chairman makes his report at the side-bar of the house; reads all the additions and amendments, &c.; and moves for leave to bring up the report to the table; which granted, he delivers it to the clerk, who reads the amendments. The speaker then puts the question, whether they shall be read a second time? and, if agreed to, reads them himself. To so many as the house acquiesces in, the question is now put, whether the bill, thus amended, shall be engrossed and written fair on parchment, and read a third time? The bill being engrossed, the speaker holds it in his hand, and asks if it shall pass? If the majority be for it, the clerk writes on it, *soit baille aux seignieurs* (let it be delivered to the lords.) Or in the House of the Lords, *soit baille aux communes* (let it be delivered to the commons.) If a bill be rejected, it cannot be again proposed during that session.

Forty members constitute a House of Commons, and eight, a committee. A member of the Commons, to speak, stands up uncovered, and directs his speech to the *Speaker* only. If what he says be answered by another, he is not allowed to reply the same day, unless personally reflected on, or by way of explanation. In the House of Lords they vote, beginning at the puisne or lowest baron, and so up orderly to the highest, every one answering apart, *content*, or *not content*. In the House of Commons, they vote by *yeas*, and *nays;* and if it be dubious which is the greater number, the house *divides*. If the question be, about bringing any thing into the house, the ayes go out; if it be about any thing the house already has, the noes go out. In all divisions, the speaker appoints four tellers, two of each opinion. In a committee of the whole house, they divide by changing sides, the ayes taking the right, and the noes the left of the chair, and then there are but two tellers. If a bill pass one house, and the other demur to it, a conference may be demanded in the painted chamber, to which certain members are deputed from each house; and here, the lords sitting covered, the commons standing bare, the case is debated. If they disagree, the affair is null; if they agree, this, with the other bills that have passed both houses, is taken to the House of Lords. The royal assent may be given, either in person, when the king comes to the House of Lords, clothed in the royal robes, and with the crown on, to whom the clerk of the parliament reads the title of each bill, and as he reads, the clerk of the crown pronounces the royal assent, or dissent: or it may be done by Lords Commissioners, nominated in a special commission, to signify his Majesty's pleasure. If it be a public bill, the royal assent is given by these words, *le roy le veut* (the king wills it to be so.) If a private one, by *soit fait comme il est desire* (be it as it is desired.) If the king refuse the bill, the answer is, *le roy s'avisera* (the king will consider of it.) If it be a money bill, the answer is, *le roy remercie ses loyaux sujets, accepte leur bienveillance, & aussi le veut* (the king thanks his loyal subjects, accepts their benevolence, and also wills it so to be.) The bill for the king's general pardon has but one reading.

The members of the *House of Commons* are gentlemen of property chosen by the people, to represent them. As the people themselves are too numerous to assemble for business, certain counties, districts, cities, boroughs, towns, &c., choose one, two, or more, to vote for them. These gentlemen must possess an estate of not less than 600*l.* a year, to represent a county; or 300*l.* a year, to represent a borough. The House of Commons now consists of 658 members. For England and Wales 513, Scotland 45, and Ireland 100.

The *House of Lords*, or *House of Peers*, consists of the spiritual and temporal lords of the realm. The spiritual lords are, two archbishops and twenty-four bishops, for Great Britain; and four bishops elected from the bishops of Ireland. The temporal lords are, dukes, marquises, earls, viscounts, and barons, by creation or descent; and also sixteen peers elected from the general peerage of Scotland; and twenty-eight peers elected from the general peerage of Ireland. The Lord Chancellor is always the *Speaker* of the House of Lords; there is sometimes also a *Deputy Speaker;* such was the late Lord Gifford. The number of members of the House of Lords necessary for the despatch of business is three only. The number of the peers may be increased at the king's pleasure.

Acts of Parliament must have the concurrence of king, lords, and commons; otherwise they are not laws.

COURT OF CHANCERY.—This is the grand court of equity and conscience, instituted to moderate the rigour of the other courts, that are confined to the strict letter of the law. This court is either *ordinary*, like other courts, according to the laws, statutes, and customs of the nation, by granting writs, &c.; or *extraordinary*, according to equity and conscience, by bills, answers, and decrees, to examine frauds, combinations, trusts, secret uses, &c.; to soften the severity of common law, and rescue men from oppression; to relieve them against cheats, unfortunate accidents, breaches of trust, &c. Out of the court of chancery are issued writs or summonses for parliaments and convocations, edicts, proclamations, charters, protections, patents, safe conducts, &c. Here are also sealed and enrolled letters patent, treaties and leagues, deeds, writs, commissions, &c. Appeals from the decisions of the Lord Chancellor can only be made to the House of Lords. The officers of this court besides the lord chancellor, who is supreme judge, are the *vice-chancellor*, the *master of the rolls*, and twelve *masters in chancery*, who are assistants, and sit, by turns, on the bench. The lord chancellor has two courts in which he sits for the despatch of business; one is in Westminster Hall, the other in Lincoln's Inn.

The office of *vice-chancellor* is of recent establishment. The vice-chancellor has a separate court, and hears and determines causes after the arguments of counsel, &c., in a similar way to the lord-chancellor; an appeal may be made from the vice-chancellor's decision to the lord-chancellor. The vice-chancellor has also a court for the despatch of business in Westminster-hall, and another in Lincoln's Inn.

The *Master of the Rolls* has also a separate court to hear and determine certain matters referred to him by the chancellor. The Rolls court is in Chancery Lane.

The KING'S BENCH is the supreme court of common law in the kingdom. Belonging to this court are four judges; a *chief* and

three *puisne* ones. The lord chief-justice of the court of King's Bench is also termed *lord chief-justice of England.* He is usually a peer, although not always one; and generally a privy-counsellor. The king used to sit in person in this court, though he determined no cause, but by the mouths of his judges. This court has great authority; it has the superintendence of all civil corporations, it protects the people and their liberties, and obliges magistrates to the discharge of their duty. It hears and determines both in criminal and civil causes; and we may appeal to this court against all determinations of the court of common pleas, and other inferior courts. The court of King's Bench holds its sittings in Westminster-hall; the chief-justice, however, occasionally holds sittings at the Guild-hall in the city of London.

COMMON PLEAS, *Communia placita*, or *Bancus communis*, one of the king's courts, now constantly held in Westminster-hall, but anciently moveable. Gwyne observes, that till the granting of Magna Charta, there were but two courts called the king's courts, *viz.* the exchequer, and the king's bench; and that, upon the grant of that charter, the court of common pleas was erected, and fixed to a place certain, *viz.* Westminster-hall: whence the writs, which before ran *coram me vel justiciariis meis*, simply, were changed, and now run *coram justiciariis meis apud Westmon.* All civil causes, real, personal, and mixed, are tried in this court according to the strict law of the realm. Fortescue represents it as the only court for *real causes.* The chief justice is called the *lord chief-justice of the Common Pleas; three other judges* belong also to this court; they occasionally assist the lord chief justice in his functions. The lord chief justice of the Common Pleas is sometimes a peer, but not generally one. He is also usually a privy counsellor. He holds sittings occasionally in the Guildhall, London.

The COURT OF EXCHEQUER is a court in which are tried all causes relating to the king's treasury, or revenue: as, concerning accounts, disbursements, customs, fines, &c. It consists of seven judges, *viz.* the *lord treasurer*, the *chancellor of the Exchequer*, the *lord chief baron*, and *three* other *barons;* and one *cursitor baron*, who administers the oaths to high sheriffs, receivers, &c. The lord chief baron is the principal judge of the court. The court of exchequer is divided into two; one, of law, the other of equity. For a long time after the Conquest, there sat in the exchequer, both spiritual and temporal barons of the realm: but in latter times there have sat in their places other judges, who, though not peers of the realm, yet retain the original denomination. The immediate profits of the crown, as of lands, tenements, hereditaments, debts, duties, accounts, goods, and chattels, disbursements and fines, imposed on the subject, are within the jurisdiction of the exchequer.—The king's attorney may exhibit bills for any matter concerning the king in inheritance of profits; so also may any person, who finds himself aggrieved in any cause prosecuted against him in behalf of the king, exhibit his bill against the king's attorney, to be relieved in this court. Authors are divided about the origin of the denomination of this court, exchequer. Du Cange is of opinion, it came from a chequer-wrought carpet, covering the great table in this court; or from the pavement of the court, which was chequerwise; others, from the accomptants in this office using chequers,

or chess boards, in their computations. The lower exchequer, called also the receipt of the exchequer, is the place wherein the king's revenue is received and disbursed.

The STAR CHAMBER was so called, because the roof was originally painted with stars. It was of ancient standing, but its authority was very much heightened by Henry VII. and VIII., who appointed, that the chancellor should have power to hear complaints against retainers, misdemeanors of officers, and other offences; which, through the power and authority of those that committed them, were above other faults; and for which inferior judges were not meet to give correction, and the common law had not sufficiently provided. The powers of this court being directed to despotic purposes, it was abolished in the reign of Charles I.

The ADMIRALTY COURT, or the High Court of Admiralty, is a court held by the high admiral, or commissioners of the admiralty; to which belong the decision of all maritime controversies (the cognizance of crimes committed on the high seas,) and the like. The court of Admiralty is said to have been first erected in 1357 by Edward III.

Society, Government, Law, and Lawyers.

SOCIETY.—Men either tacitly or by consent have, in all ages, associated together for their pleasure or their convenience; hence it has been laconically but aptly stated, that the origin of society is our own wants. Whether in the earlier ages of the world formal contracts were entered into in regard to mutual association, cannot now be known; but there can be no doubt that a conviction of the weakness of individual effort to promote human happiness first led to the union of the efforts of numbers for its more complete accomplishment. The first and most probable association was that of persons of the same family; as families multiplied, their relationship of consanguinity decreased in intensity, and social relations, independently of blood, necessarily and naturally grew up. This appears to be in perfect accordance with the revealed accounts of the primitive origin of mankind, where single families formed the first society among themselves, which every day extended its limits; and when it grew too large to subsist with convenience in that pastoral state, in which the patriarchs appear to have lived, it necessarily subdivided itself by various migrations. Afterwards, as agriculture increased, migrations became less frequent; and various tribes, which had formerly separated, re-united; sometimes by compulsion and conquest, sometimes by accident, and sometimes perhaps by compact. But though society had not its formal beginning from any convention of individuals actuated by their wants, yet it is a sense of their weakness and imperfection that keeps mankind together; that demonstrates the necessity of this union; and that, therefore, is the solid and natural foundation, as well as the cement of society. This is what is meant by the original contract of society; which, though perhaps in no instance ever formally expressed at the first institution of a state, yet in nature and reason it must always be understood and implied in the very act of associating together, that *the whole should protect all its parts*, and that *every part should pay obedience to the will of the whole;* or, in other words, that the community should guard the

rights of each individual member, and that in return for this protection, each individual should submit to the laws of the community.

GOVERNMENT.—As *society* arises from our wants, so arises *government* from our errors, vices, and crimes. Were man a perfect being he would not need government. Individual security and happiness being the true end and design of government, whatever form insures it with the least expense, consistent also with the general security and happiness, is to be preferred. Government being therefore necessary for the preservation of social order, it is obvious that the exercise of it should be committed to persons in whom those qualities are most likely to be found, the perfection of which is among the attributes of him, who is emphatically styled the Supreme Being; namely, *wisdom*, *goodness*, and *power :* wisdom, to discern the real interest of the community ; goodness, to endeavour always to pursue that real interest ; and strength, or power, to carry this knowledge and intention into action. These are the natural foundations of sovereignty ; and these are the requisites that ought to be found in every well-constituted government.

DIFFERENT FORMS OF GOVERNMENT.—The political writers of antiquity will not allow above three regular forms of government ; the first, where the sovereign power is lodged in an aggregate assembly consisting of all the members of a community, is called *democracy ;* the second, where it is lodged in a council composed of select members, when it is styled *aristocracy ;* the last, where it is intrusted to the hands of a single person, and then it takes the name of *monarchy.* All other species of government, they say, are either corruptions of, or reducible to these three. By *sovereign* power is meant that which makes and executes, or directs the execution of the laws. Wherever this power resides, all others must conform to, and be directed by it. For it is always at the option of such power to alter the form and administration by new laws, and to put the execution of the laws generally into whatever hands it pleases ; and all the other powers of the state must, of course, obey it in the execution of their several functions, or else the constitution is at an end.

In a *Democracy*, where the right of making laws resides in the people at large, public virtue, or goodness of intention, is *more likely* to be found than in either of the other forms of government. Popular assemblies are, however, frequently weak in their plans, and slow in their execution ; though they generally *mean* to do the thing that is right and just, and have always a certain degree of patriotism or public spirit.

In *Aristocracies* there is more coolness and deliberation than in, perhaps, any other form of government ; and from their being composed usually of the richest members of the state, they have opportunities for the acquisition of knowledge, which are denied to the ordinary citizen ; yet, from the absence of motive to excite their intellects, it does not ordinarily follow that the aristocracy constitutes the wisest portion of a state ; the persons composing the aristocracy are, besides, generally removed, by their situation, from that sympathy necessary to enable them to consult, without prejudice, the interests of the main body of the people ; and hence, of all the forms of government, aristocracy appears to be the worst.

An *absolute monarchy* is the most powerful of any ; and, provided it were possible to have a perfect man as a monarch, we could not

hesitate as to the choice between these three kinds of government. As, however, an absolute monarch is very likely to employ his power to the great injury of a state, such a government cannot be approved.

Among the ancients, Cicero seems to consider the best republic to be that which consists of an admixture of the regal aristocratical, and popular kind:—" *esse optime constitutam rempublicam, quæ ex* tribus generibus illis, *regali, optimo, et populari, sit modice confusa.*" Tacitus, however, treats this notion of a government as a visionary whim, and one that, if established, could never be lasting or secure; but the ancients were little, if at all, acquainted with real *Representative* Government.

The BRITISH CONSTITUTION is an eminent proof that Cicero was wiser than Tacitus. For, as with us, the executive is lodged in a single person, we have all the advantages of strength and despatch, that are to be found in the most absolute monarchy; and as the legislature of the kingdom consists of three distinct powers, in some measure independent of each other: first, the *king;* secondly, the *lords* spiritual and temporal, the chief of the aristocracy; and thirdly, the *House of Commons*, chosen by the people, which makes it a kind of democracy; this aggregate body, actuated by different motives and interests, composing the British parliament, and having the supreme disposal of every thing, there can be no violence attempted by either of the three branches, but will be withstood by one of the other two; each branch being armed with a negative power, sufficient to repel any innovation, which it may think inexpedient or dangerous. *Here then is lodged the sovereignty of the British Constitution.*

But it ought to be mentioned, that although it frequently happens, that the house of lords reject bills sent up from the commons and occasionally the house of commons reject bills sent down from the lords, yet that the king does not now exercise his prerogative of the *veto* or refusal to sanction a law. The usual course is, before the period arrives at which his sanction must be asked, to prorogue or dissolve the parliament. This is considered a more politic and less offensive proceeding; but even this is now rarely resorted to; and is scarcely, if ever, necessary.

It appears, however, that the chief strength and the long permanence of the form of the government of this country are insured by the great body of the people, or at least a large portion of them, having a voice in the election of members of parliament; in other words being *represented* in the house of commons; and hence no measure of importance to the general interest can become a law without undergoing publicity and discussion. It is this publicity and discussion that ensure, more than any thing besides, a wholesome balance of opinions and of interests: hence also our equitable jurisprudence, our useful laws.

[The following sketch of the Constitution of the United States is taken from "The Literary and Scientific Class Book."—*Amer. Publishers.*

"The government of the United States is called republican. It is a representative democracy. All power resides ultimately in the people; but they exercise it by means of their representatives, or persons chosen by them for that purpose. All the departments of the government are bound to conform to the provisions of the constitution, and

the act of any one of them, even an act of Congress, if contrary thereto, is void.

"The most fundamental article in every form of government is the *legislative* branch, which has the power of making all the laws and regulations to which the whole community must be subject. This, in the United States, consists of a senate and house of representatives, jointly called the *Congress*, which must be assembled at least once every year. The senate consists of two members from each of the separate states, chosen by the legislatures of each state to serve for six years. The seats of one third of the senators are vacated every two years. The senate tries all persons impeached by the house of representatives; but they can only punish by deprivation of office, or disqualification in future; and the conviction must be by the votes of two thirds of the members present at any trial. The Vice-president presides in the senate, but without a vote, except in case of an equal division of the votes of the other members. No person can be a senator who has not attained to the age of thirty years.

"The members of the house of representatives must be twenty-five years of age, and they are chosen by the people at large every two years. The number of the representative body varies according to the number of the separate states, and the population of each state. For this purpose an enumeration of all the people must be made every ten years, and the number of representatives must never exceed one for every thirty thousand, but each state shall have at least one representative. The senators and representatives receive a compensation for their services, to be ascertained by law, and paid out of the treasury of the United States. All bills for raising revenue must originate in the house of representatives; but the senate may propose or concur with amendments as on other bills.

"The *judicial* power is vested by the constitution in a supreme court, and such inferior courts as Congress shall from time to time appoint; and all the judges hold their office during good behaviour. Besides the ordinary exercise of its power of deciding controversies, it is incident to the judicial power of the United States to pass upon the acts of Congress, and decide upon their constitutionality; a power essential to the rights of the people, but not known in any of the governments of Europe.

"The *executive* power is vested in a President, who is chosen every fourth year by electors appointed in the methods prescribed by the constitutions or legislatures of the separate states. If no person have a majority of the votes of the electors, then from the persons having the highest numbers not exceeding three on the list of those voted for, the house of representatives shall choose the president by ballot. But in choosing the president, the votes must be taken by states, the representatives from each state having one vote. If no person have a majority of the votes of the whole number of electors for vice-president, then from the two highest numbers on the list, the senate shall choose the vice-president.

"The president must be thirty-five years of age, and he may be re-elected as often as the people please. He is liable to be impeached and removed from office for misbehaviour. He is the commander in chief of the army and navy: and by and with the advice and consent of the senate, makes treaties, appoints judges, foreign ministers, and other officers. If the president disapprove of any bill presented to

him, after having had the concurrence of both houses, he must give his objections to it; and if two thirds of each house still abide by their first vote, the bill passes into a law, notwithstanding his rejection of it.

"Besides the general government, whose power for many purposes extends over the whole union, each state has a separate local government, whose jurisdiction is confined to the regulation of its own concerns. These separate governments are all republican, and consist generally of a governor, and two legislative branches, though the powers of the different departments are variously modelled in the several states."]

LAW, in its most comprehensive sense, signifies a *rule of action:* and is applied indiscriminately to all kinds of actions. The *Laws of Nature*, are those regulated motions or conditions of natural bodies which pervade all creation, both animate and inanimate.—In a more restricted sense, the laws of nature are applied to those feelings and actions resulting from them, which man evinces even in the most rude and barbarous state of society, without relation to social, much less civil, government. Hence, it is a law of our nature to sympathize with the unfortunate, and to succour the distressed. Upon the laws of nature, regulated by reason and discretion, are founded, or ought to be founded, the laws of all social communities.

The *Law* of social communities consists of two kinds: the *Law of Nations;* and the *Municipal* or *Civil Law.*

The *Law of Nations* consists in those usages arising either from natural law or from mutual compacts, treaties, leagues and agreements between the several communities, all which must be based, in some sort, on the laws of nature.

Municipal or *Civil Law* is a rule of conduct, prescribed by the legislature or other supreme power of a state. The nearer municipal laws approach the laws of nature, when regulated by reason and discretion, the more certain it is that they will be followed and obeyed: no law will long obtain credit that is violently opposed to the natural feelings and common sense of mankind.

It is scarcely necessary to add, that wherever the supreme authority resides in a state, there also resides the power as well as right, to make laws for the regulation of the conduct of the individuals of which the state consists.

But we desire emphatically to observe, that the more simple and intelligible a law, if agreeable to our nature and founded in justice, the more readily will it be obeyed; that all laws which are intricate and perplexing will never be respected; and that the efforts which have been lately made to simplify the laws of this country deserve here honourable mention; nor should the name of the Right Honourable Robert Peel be omitted in this notice of legal amelioration, who has devoted so much of his mind to this interesting subject; and who will, we hope, still continue to proceed in such useful reforms.*

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* One of the greatest errors in our legislation during the last and present century has been, a desire to make laws to embrace every anomaly which arises in this country, and which our present laws cannot reach; this minuteness of legislation is very reprehensible; it should be carefully watched.

LAW OF ENGLAND.—JUDGE.—JURY, &c.

The municipal law of England, or the rule of conduct prescribed to the inhabitants of this kingdom, is usually divided into two kinds, the *lex non scripta*, the unwritten or common law ; and the *lex scripta*, the written or statute law.

Common Law.—The *lex non scripta*, or unwritten law, includes not only general customs, or the common law, properly so called ; but also the particular customs of certain parts of the kingdom ; and likewise those particular laws that are, by custom, observed only in certain courts and jurisdictions. In calling these parts of the law *leges non scriptæ*, we would not be understood, as if all these laws were at present merely oral, or communicated from the former ages to the present solely by word of mouth. It is true, that from the profound ignorance, which formerly overspread the whole western world, all laws were entirely traditional : because the nations among which they prevailed had but little idea of writing. Thus the British and Gallic Druids committed all their laws, as well as learning, to memory. But with us, the monuments and evidences of our legal customs are contained in the records of the several courts of justice, in books of reports and judicial decisions, and in the treatises of learned sages of the profession, preserved and handed down from times of the highest antiquity.—We therefore style these parts of our laws *leges non scriptæ*, because their original institution and authority are not set down in writing, as acts of parliament are ; but they receive their force as laws, from long and immemorial usage, and by their universal reception throughout the kingdom. Antiquaries and historians assure us, that our laws are of a compound nature ; and that in the time of Alfred, the local customs of the several provinces of the kingdom being grown so various, he found it expedient to compile his Doom-book, for the use of the whole kingdom. This book is said to have been extant so late as the reign of Edward IV., but it is now unfortunately lost. The irruption and establishment of the Danes in England, which followed soon after, introduced new customs, and caused this code of Alfred to fall into disuse, or at least to be mixed and debased with other laws : so that, about the beginning of the 11th century, there were three principal systems of laws prevailing in different districts.*

The Written Laws.—The oldest of these now extant, and printed in our statute book, is the famous *Magna Charta*, as confirmed in parliament, 9 Hen. III. : though, doubtless, there were many acts before that time, the records of which are now lost, and the determinations of them, perhaps, at present currently received for the maxims of the old common law.

The chief, however, of our *written* laws are those statutes or *acts of Parliament* which have been passed, from time to time, since the signa-

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* The great and radical defect of what is called *common law* consists in much of it not being with any certainty known, even by the lawyers themselves ; as we find what is considered the law at one time or in one place, is not so considered at another time, even in the same place.

ture of *Magna Charta* by King John. They consist (1829) of upwards of 316 volumes in folio, as originally printed by the government; or in 29 closely printed quartos: every year lately the Parliament has added considerably to the number; a thick volume at least.

These are the several grounds of the laws of England, which *equity* is frequently called in to assist, moderate, and explain. *What equity is*, and how impossible, in its very essence, it is, to be reduced to stated rules, has been already shown. It may be sufficient, therefore, to add, in this place, that, besides the liberality with which our judges interpret acts of parliament, and such rules of the unwritten law as are not of a positive kind,there are also *courts of equity* established, for the benefit of the subject, to detect latent frauds and concealments, which the process of the courts of law is not adapted to reach; to enforce the execution of such matters of trust and confidence, as are binding in conscience, though not cognizable in a court of law; to deliver him from such dangers as are owing to misfortune or oversight; and give a relief, more specific, and better adapted to the circumstances of the case, than can be obtained by statute or common law. This is the business of the *courts of equity;* which, however, are only conversant in *matters of property:* the freedom of our constitution not permitting, in criminal cases, a power in any judge, to construe the law otherwise than according to the letter. This caution, while it admirably protects the public liberty, can never bear hard upon individuals. A man cannot suffer *more* punishment than the law assigns, but he may suffer *less*. The laws cannot be strained, by partiality, to inflict a penalty beyond what the letter will warrant; but, in cases where the letter induces any apparent hardship, the crown has the power of pardoning.

An Act of Parliament is a positive law, consisting of two parts, the *words* of the act, and its *true sense* and meaning; which, being joined, make the law. The *words* of acts of parliament should be taken in a *lawful sense.* Cases of the same nature are *within the intention*, though *without the letter* of the act; and some acts extend, by equity, to things not mentioned therein.

A JUDGE is a legal officer appointed by the sovereign power of a state, to distribute justice to the subject. The chief function of judges is the trial of causes, both civil and criminal. The English judges are chosen from among the serjeants at law, and are constituted by letters patent. There are twelve judges in England. By Statute 1 Geo. III. c. 23, they are to continue in their offices during good behaviour, notwithstanding any demise of the crown, (which was formerly held immediately to vacate their seats;) and their full salaries are secured to them during the continuance of their commissions: by which means the judges are rendered, in some measure, independent of the king, his ministers or successors. There are also, besides the *twelve* judges (four of which, as before noted, belong to the King's Bench, four to the Common Pleas, and four to the Exchequer) other learned persons usually considered as judges; namely, the *Lord Chancellor*, the *Master of the Rolls*, the *Vice Chancellor*, and the *Attorney* and *Solicitor General;* there are also eight other judges or *Justices of the Great Sessions in Wales.* These usually consist of barristers. The principal *Judges of Scotland* are called *Lords of Ses-*

sion; they are in number 14; there are also others, which we cannot enumerate.

ATTORNEY GENERAL, an important judicial officer under the king, whose duty consists in exhibiting informations, and prosecuting for the crown in criminal cases. He also files the bills in the Exchequer for any thing concerning the king in inheritance or profits. To him come warrants for making grants, pardons, &c. He is also the leading counsel in all trials in which the king is concerned, &c. &c.

SOLICITOR GENERAL is another judicial officer belonging to the king; he has also the care of the king's affairs and has fees for pleading, besides other fees arising from patents, &c. In criminal prosecutions by the crown he sums up the evidence; he attends also on the privy council. The attorney and solicitor general are usually members of parliament. Both were formerly reckoned among the officers of the Exchequer.

SERGEANT at law is the *highest degree* taken in the common law, as that of doctor is in the civil law. Sergeants were anciently called *servientes ad legem.* Mr. Selden adds, they were also called *doctores legis:* though others are of opinion, that the judges are more properly *doctores legis* (doctors of law;) and sergeants, bachelors of law. Spelman observes, that, however a sergeant may be richer than all the doctors of the commons, yet a doctor is superior in degree to a sergeant; for the very name of a doctor is magisterial; and that of a sergeant, ministerial. *A Sergeant-at-law* is distinguished from barristers by a black patch on the top of his wig; the judge always addresses him by the familiar title of "*Brother.*"

Of COUNSELLORS there are two degrees, *sergeants* and *barristers.* Barristers, after having been admitted five years in any of the Inns of court, such as Lincoln's Inn, the Temple, &c., are called to the bar; but for members of the universities, being bachelors of laws or masters of arts, *three* years are sufficient. Barristers are seldom called to the degree of sergeants till after ten years' standing. Out of these the king's counsel are usually selected, the principal of whom are the attorney and solicitor general, who cannot be employed in any cause against the crown, without special licence. They are heard before other counsel, and even before sergeants. The king's counsel are distinguished by silk gowns, the ordinary barristers by stuff ones.

JUSTICE, an officer appointed by the king, or commonwealth, to do right by way of judgment. He is called justice, not judge; anciently, *justicia*, not *justiciarius*, because he has his authority by deputation, as delegate from the king; so that he cannot depute any other in his stead, the justice of the forest only excepted. Of these justices we have various kinds in England, *viz.*

The Lord Chief Justice of the King's Bench, is the chief justice of Great Britain, a lord by his office, and usually a peer.—His business is, chiefly, to hear and determine all pleas of the crown; that is, such as concern offences against the crown, dignity, and peace of the king, as treasons, felonies, &c. He is also both a civil and criminal judge, and causes from inferior courts may be brought before him, and decided. This officer was formerly not only chief justice, but also chief baron of the Exchequer, and master of the court of wards. He usually sat in the king's palace, and there exe-

cuted his office ; he determined, in that place, all the differences happening between the barons and other great men.

The Lord Chief Justice of the Common Pleas, with his assistants, hears and determines all causes at the common law ; that is to say, all civil causes between common persons, as well personal as real ; he is also a lord by office, but not always a peer.

The Justice of the Forest is a lord by his office, who has power and authority to determine offences committed in the king's forests, &c., which are not to be determined by any other court or justice. Of these there are two, whereof one has jurisdiction over all the forests on this side Trent, and the other, beyond it. By many ancient records, it appears to be a place of great honour and authority, and is never bestowed but on some person of great distinction. The court where this justice sits is called the *justice-seat of the forest.* This is the only justice who may appoint a deputy ; he is also called *justice in eyre of the forest.*

Justices in Eyre are those itinerant Judges sent with commissions into divers counties, to hear such causes especially as are termed pleas of the crown ; and this for the ease of the subject, who must otherwise be hurried to the courts of Westminister, if the cause were too high for the county courts. They are much like the justices of assize ; though, in authority and manner of proceeding, somewhat different.

Justices of Assize are those judges sent by special commission into this or that county, to hold assizes for the ease of the subject. For, as these actions pass always by jury, so many men could not, without great damage and charge, be brought up to London ; and, therefore, justices for this purpose, are sent to them. These *twice* every year, pass the circuit by two and two, through all England, despatching their business by several commissions : one to take assizes, another to deliver gaols, and another of oyer and terminer, &c. Latterly, in the districts around London, *three* assizes have been held annually.

Justices of Gaol-Delivery, those commissioned to hear and determine causes relating to such as, for any offence, are cast into prison. Their commission is now turned over to the justices of assize.

Justices of Nisi Prius are now the same with justices of assize : it is a common adjournment of a cause in the Common Pleas, to put it off to such a day, *nisi prius justiciarii venerint ad eas partes capiendas assisas :* from which clause of adjournment they are called justices of *nisi prius*, as well as justices of assize, by reason of the writ, and actions they have to deal in.

Justices of Oyer and Terminer were justices deputed on some special occasions, to hear and determine particular causes. The commission of *oyer* and *terminer* is directed to certain persons, upon any insurrection, heinous demeanour, or trespass committed.

Justices of the Peace are persons of respectability and credit, appointed by the king's commission, to attend to the peace of the county where they live. Of these some, for special respect, are made of the *quorum*, so that no business of importance can be despatched, without the presence or assent of them, or one of them*. The office

* This was formerly the practice, but at present, we believe, every justice of the peace is of the *quorum*.

of a justice of the peace is, to call before him, examine, and commit to prison, all thieves, murderers, vagrants, rogues, those that hold conspiracies, riots, and most delinquents who occasion any breach of the peace, &c.: to commit to prison such as cannot find bail, and see them brought forth, in due time, to trial. The origin of justices of the peace is referred to the fourth year of Edward III. They were first called *conservators* or *wardens of the peace*.

RECORDER, a person whom the mayor and other magistrates of a city or corporation choose for their better direction in matters of justice and proceedings in law; he is usually a councellor or other person well skilled in the law. The recorder of London is held to be the mouth-piece of the city; he delivers the judgment of the courts; he is the usual judge at the criminal sessions at the Old Bailey, often assisted, however, by other judges; and he records and certifies the city customs. In Bristol, the chief, if not only office of the recorder is to preside as judge in the criminal court, till lately *once*, but now *twice* a year.

SOLICITOR, is a person who does in chancery for a client what is done by an attorney in other courts.

ATTORNEY, or *Attorney-at-law*, is the person who manages the law business of another for whom he is retained. Attornies are admitted to the execution of their office by the superior courts at Westminster Hall. They are considered as officers of the respective courts in which they are admitted; on which account they enjoy many privileges; and are peculiarly subject to the censure and animadversion of the judges. An attorney in any of these courts must be admitted and sworn an attorney of that particular court. An attorney in the King's Bench cannot practise in the Common Pleas, nor can an attorney in the Common Pleas practise in the King's Bench. To practise in the court of Chancery it is also necessary to be admitted a solicitor therein.

INNS OF COURT.—Our colleges of municipal or common law professors and students are still called inns, which is the old English word for houses of noblemen, bishops, and others of extraordinary note; being of the same signification with the French word, *hotel*. Inns of court are so called, as some think, because the students there are to serve and attend the courts of Judicature; or else, because anciently those colleges received none but the sons of noblemen, and better sort of gentlemen, who were to be qualified to serve the king in his court, as Fortescue affirms. Of these we have four, viz. the two Temples, once the dwelling of the knights-templars, purchased by some professors of the common law about 350 years ago; Lincoln's Inn, and Gray's Inn, formerly belonging to the Earls of Lincoln and Gray. The whole company of gentlemen in each society may be divided into four parts; benchers, outer-barristers, inner-barristers, and students.

Inns of Chancery were probably so called, because they were inhabited by such clerks as chiefly studied the forming of writs, which regularly belonged to the cursitors, who are officers of Chancery. The first of these is Thavies Inn, begun in the reign of Edward III., and since purchased by the society of Lincoln's Inn; then New Inn, Symond's Inn, Clement's Inn, Clifford's Inn, anciently the house of Lord Clifford; Staple's Inn, belonging to the merchants of the Staple; Lion's Inn, formerly a common inn with the sign of the lion;

Furnival's Inn, and Bernard's Inn. These were formerly preparatory colleges for younger students, and many were entered here, before they were admitted into the inns of court. Now they are mostly occupied by attornies, solicitors, &c. They all belong to some of the inns of court, who send yearly some of their barristers to read to them.

JUROR, in a legal sense, is one of the twelve or a greater number of persons constituting a jury, who are sworn to deliver an opinion of the truth from such evidence as shall be given to them concerning any matter in question. The punishment of petty jurors, attainted of giving a verdict contrary to the evidence, is very severe.

JURY, in law, signifies a body of men sworn to inquire into some matter of fact or facts, and to declare the truth upon such evidence as shall be delivered to them concerning the matter in question.

A jury usually consists of *twelve* persons; at least all *common* or *petty*, *nisi prius*, and *special juries*, consist of this number. But *grand* juries, and some others, consist of an uncertain number, thirteen or more, usually any number between twelve and twenty-four. In juries consisting of twelve, the verdict must be unanimous; in those whose number is uncertain, their opinion is determined by the majority.

In ordinary *criminal* cases the jury is selected from persons in the rank of society between those considered as *poor* and those usually denominated the *rich;* and, till lately, it was necessary that a juryman should be a housekeeper; but this qualification is not now necessary; a possession of some property, and a fixed residence are, however, indispensable to constitute a juryman in *criminal* and most other cases. If the accused be a foreigner he may demand a jury half foreigners and half Englishmen. Forty-eight are usually summoned, of which the accused of murder or felony may peremptorily challenge or set aside *twenty;* in high and petit treason *thirty-five.* Twelve being sworn, attend the trial; and should they not agree immediately on the verdict, they are shut up by themselves, without fire or candle, food or drink, till they declare unanimously the defendant guilty or not guilty of the crime of which he is accused. If guilty, the judge passes the sentence prescribed by the law.

In England there are two modes of trial, by *parliament*, and by *assize* or *jury.*

In the trial by *assize*, be the action civil or criminal, public or private, personal or real, the ultimate decision is by a jury; and, according as the jury decides, is judgment pronounced. This jury is not only used at the different *assizes* on the circuits of the judges throughout the kingdom, but also in the courts at Westminster, and in many other courts, and on many other occasions; at the quarter sessions, at the county courts, &c. &c. at the inquisition of the *coroner*, and on some other occasions a jury is called an inquest, and in the court-baron a *jury of the homage. Inquest* is, however, a very comprehensive word. The House of Commons is considered the *grand inquest of the nation.*

In the *general assizes* there are several juries, because there are commonly a great many causes, both civil and criminal, to be tried: one is called the *grand jury*, another *special jury*, and the rest *petty juries.*

The *grand jury* consists of from twelve to twenty-four grave and

substantial gentlemen, or some of the better sort of yeomen who are also freeholders, chosen indifferently by the sheriff out of the whole county *to consider all bills of indictments preferred to the court;* which they, after hearing the evidence for the prosecution only, not for the defence, either approve by writing upon them *billa vera*, or *true bill;* or disallow, by indorsing *ignoramus*, or *no bill.* Such as they approve, if relating to crimes of persons in custody or on bail and awaiting their trial, are referred to the petty jury to be more minutely considered, and where the party accused is confronted with his accusers and *tried* for the crime of which he is accused. When the grand jury do not approve or *find the bill* the accused is, at once, set free. The examinations of witnesses by the grand jury is always private;—the *trial* of an accused person before a jury is always in open court, and before the public.

A *Petty* or *Petit Jury* consists of twelve men. These are empanelled as well upon criminal as civil causes; these last, however, are usually called a *nisi prius jury.* Those who deliberate on criminal cases bring in their verdict either guilty or not guilty. The prisoner, if found guilty, is said to be convicted, and receives judgment and condemnation; or otherwise is acquitted and set free. In civil suits the verdict is given either *for the Plaintiff* or *for the Defendant.*

A *Special jury* consists, like *petty* and *nisi prius* juries, of twelve men. They must be either gentlemen of good property, and commonly denominated esquires, or merchants and bankers also possessing property. Their qualification and mode of selection are, by an act of parliament passed in the year 1825, particularly determined. *Special* juries are generally preferred by litigant parties to common juries, where more knowledge appears necessary than that with which ordinary persons are endowed. They are also sometimes chosen by the government when prosecutions are instituted by the attorney-general for libel. Each special juryman is paid *one guinea* for every trial on which he decides.

The payment of common jurymen is very trifling; in the court of Common Pleas at Westminster, it is *one shilling* to each juryman for every trial on which he is; in some other courts it is not, we believe, more than fourpence; common jurymen, if chosen to act with special jurymen, receive the same as the special jurymen.

The laws relating to juries were materially altered in the year 1825; for these alterations we are indebted to the industry, talent, and perseverance of Mr. Peel, who has simplified and materially improved our jury code; or rather has disencumbered the statute book of above *eighty* acts of parliament, reduced to a few pages all that is essential, and rendered the law more conformable to the wants, demands, and intelligence of the age.

The *trial by jury* is considered, and in fact unquestionably is, the best bulwark of the liberties of an Englishman; especially since it has been determined by an act of parliament in regard to libels, passed in the year 1792, that the jury are to judge, not only of the *fact*, but of the *law* relating to that upon which they are called upon to decide. For this act of parliament we are indebted to Mr. Fox. The trial by jury is the distinguishing privilege of every Briton: and one of the greatest advantages of our constitution; for while those who offend against the laws, or those who appeal to the laws possess the advantage of having the question settled by their *peers*, it is not pro-

bable that much injustice will often, if ever, be committed. It should be mentioned, that although in disputes concerning property of any importance, or in criminal matters touching life or limb, the *trial by jury* is invariably resorted to, yet, on many occasions, it is nevertheless dispensed with; as in a suit at the *Court of Requests* for debt, the decision of the commissioners is final and without appeal; and in some cases of assault the magistrates have now a power to fine and imprison without the sanction of a jury. These summary proceedings do doubtless curb the disposition for litigation and brawling in those who are unfortunately possessed of such a spirit; whether they are in exact accordance with the spirit of the rest of our laws, it is not our business here to inquire.

Imprisonment for debt where the sum is twenty pounds, or more is not, indeed, in the first instance, a subject of judicial inquiry; a debtor being liable to be arrested and kept in prison by a creditor, upon the mere affidavit of such creditor that the debtor owes him the money. This has been long complained of by many of our intelligent legislators as a great hardship; it will, we doubt not, in time be remedied.

CIVIL CAUSES.—This term implies questions or disputes concerning infringements upon *property* in contradistinction to *criminal causes*, which are considered as breaches of the peace. Criminal causes are begun by the persons aggrieved, but they are carried on in the *king's name*, who is considered the chief magistrate, and enforcer of the laws. Civil causes are instituted and carried on altogether at the suit of the plaintiff.

An OATH, in a *legal sense*, is a solemn action, whereby God is called to witness the truth of an affirmation given before one or more persons, empowered to receive the same. Legal oaths end with, So help me God; anciently with, So help me God at his holy dome, *i. e.* judgment. This, according to our law-books, is called a corporal oath, because the party, when he swears, touches the Gospels with his right hand. Oath is also used for a solemn promise, faithfully to execute or observe something. In this sense we say, state oaths; the oaths of supremacy, allegiance, and abjuration. At the meeting of a new parliament, the commons take the oaths of allegiance, supremacy, and abjuration. By the *oath of allegiance*, a man swears fidelity and loyalty to his king; and by the *oath of supremacy* he abjures the *pope*, and acknowledges the king to be the head of the church.

By particular statutes the evidence on the *affirmation* of a *Quaker* is *now* to be received in all cases both *civil* and *criminal* the same as that of other persons on their oath; and the false evidence of quakers on their affirmation in a court of justice, &c. is punishable in a similar manner as that of perjury in other persons. It should, however, be mentioned that the evidence of Quakers on their affirmation was only admissible in *civil*, and not in criminal cases till the year 1828, when the alteration as above was made in our laws.

ASSIZE or ASSISE; in law, a sitting of judges, or justices, for the hearing and determining of causes. The word is French, *assise* or *assis*, seated; formed of the Latin *assideo*, I sit by: which is compounded of *ad* to, and *sedeo*, I sit. An assize may be defined a court, place, or time, where and when writs and processes, either civil or criminal, or both, are considered, despatched, decided, &c., by judges

and jury. In this sense we have two kind of assizes; *general* and *special:* the latter may be appointed for some particular purpose, and held by some of the judges who go the circuits.

General Assizes are those holden by the judges, twice a year, in their several circuits. All the counties of the kingdom are divided into six circuits; through each of which two judges go twice a year, who have several commissions by which they sit, *viz.* First,—A *commission of oyer and terminer*, directed to them and others in their respective circuits. This commission gives them power to judge of treasons, murders, felonies, and other misdemeanors. The second is of *gaol delivery;* which is only to the judges themselves, and the clerk of the assize, associate. By this commission they judge every prisoner in the gaol, for what offence soever. The third is directed to themselves and the clerk of the assize, to take writs of possession, called also assizes, and do right and justice thereupon. The fourth is to take Nisi Prius, directed to the justices and clerks of assizes, whence they are also called justices of Nisi Prius. The fifth is a commission of the peace in every county of their circuit; and all the justices of the peace, having no lawful impediment, are bound to be present at the assizes, to attend the judges. The sheriff of every shire is also to attend in person, or by sufficient deputy allowed by the judges, who may fine him, if he fail. This excellent constitution of judges, circuits, and assizes, was begun in the time of Henry II., though somewhat different from what it is now.

Crimes and Punishments.

That the conduct of persons who, in numerous instances, interrupt the peace and good order of society ought to be *restrained*, can admit of no doubt. That those actions, usually denominated *crimes*, should be more particularly prevented, not only the peace, good order, and happiness of the community imperiously demand, but, as example is always more or less contagious, it is necessary, in order that similar conduct should not be repeated, that certain restraints and penalties should follow the infraction of those laws which have been established as means for the security and general happiness of all. Hence the origin of *punishments;* the objects of which ought always of course to be, and in all enlightened legislation are so considered—the *prevention of crime* and the *reformation of the offender*. All punishment which does not accomplish one at least of these objects is unwise; the punishment which is merely *vindictive* and inflicted without a view to present or prospective good, is at once absurd and irrational.

Punishments do not appear to operate upon mankind as deterrents from crime in the ratio of their severity; besides which, when the punishment for a crime is *death*, it often happens that benevolent persons refuse to prosecute, and thus the offender escapes; whereas, were it less severe, the criminal would most probably be restrained, and the lesson of his restraint would, it is presumed, be beneficial to the community.

The *criminal laws* of this country have lately, by the persevering industry of Mr. Peel, undergone great revision; and although, in the opinion of many persons, they are not yet sufficiently adapted to the enlarged views and better feelings of the country, they are nevertheless

rendered much more simple and intelligible ; and will, we doubt not, undergo, now that the *spirit of improvement* is abroad, further and more extensive changes, accordant with the knowledge and the benevolent spirit of the age.

We shall note, as we pass along, some of the most important alterations which our criminal laws have lately undergone.

FELO-DE-SE is he who commits felony, by willingly and deliberately killing himself. The Saxons called him self-bane. Till lately, suicides were in this country, by law, refused Christian burial ; their goods became forfeited ; and they were ordered to be buried in some cross-road and a stake to be driven through their bodies. These barbarous proceedings are now done away, except that the suicide is not to have the burial service performed over him when his body is committed to the earth.

FELONY was anciently used for a violent and injurious action of a vassal, or tenant, against his lord. In which sense, felony was equivalent to petty treason, or it was a crime next below high treason. Felony was also applied to an injury of the lord to his vassal, which imported a forfeiture of the homage and service thereof, and made it revert to the sovereign. Felony is also used in common law for any capital offence, perpetrated with an evil intention. In a stricter sense, felony denotes an offence next below that of petty treason. Felony includes several species of crimes, the punishment of which is the same, *viz.* death ; such as murder, theft, forgery, sodomy, rape, wilfully burning of houses, receiving stolen goods, and divers others, found in the statutes, which are daily making crimes felony, that were not so before. Felony is easily distinguished from treason. From less crimes, it is distinguished by this, that its punishment is death, though not universally. Till the reign of Henry I. felonies were punished by pecuniary fines ; that prince first ordered felons to be hanged, about the year 1108.

Till lately, felony implied a crime to which, generally, forfeiture of lands or goods and chattels is attached. But it was enacted (7 & 8 Geo. IV. cap. 28.) in 1827, " That, where any person shall be indicted for treason or felony, the jury empanelled to try such person shall not be charged to inquire concerning his lands, tenements, or goods, nor whether he fled for such treason or felony :" we consequently conclude that now neither traitors nor felons forfeit, on conviction, either lands, goods, or chattels. Felony, in common language, includes by far the greatest part of the criminal offences committed in this country, and those who commit them are termed *Felons*. Many felonies are now, by the act mentioned below under *Larceny*, punished as larcenies.

PERJURY is the crime of swearing falsely, in a lawful oath, administered by one who has authority in any matter relating to a cause in question, whether it be of a person's own accord, or by subornation of another. *Subornation* of perjury is the offence of procuring another to take a false oath, which constitutes perjury in the principal. The punishment of perjury and subornation, at common law, has been various. It was anciently death ; afterward, banishment, or cutting out the tongue ; then, forfeiture of goods ; and now, it is fine and imprisonment, and sometimes the pillory, and never more to be capable of bearing testimony. See OATH.

LARCENY is a theft of personal goods or chattels in the owner's

absence. Larceny was till lately distinguished into two sorts, *great* and *small*. *Great* or *grand larceny* when the things stolen, though severally, exceed the value of twelve pence. *Petty larceny* when the goods stolen did not exceed the value of twelve pence. But by an act, passed in 1827, the distinction between grand and petty larceny was abolished, and every larceny, whatever be the value of the property stolen, is deemed to be of the same nature and is subject to the same incidents in all respects as grand larceny was before the passing of this act. When it is done by force, it is called *robbery*. Plain theft, unaccompanied by any other atrocious circumstance, is also deemed *simple larceny*; and, when it includes in it the aggravation of taking from one's house or person, it is called *mixed* or *compound larceny*.

Simple larceny, by the act above named, is punishable (unless specifically provided for) at the discretion of the court by transportation for seven years, or imprisonment for two years, and if a male, to be once, twice, or thrice whipped, at the discretion of the court, in addition to such imprisonment; the imprisonment may be also accompanied with hard labour or solitary confinement.

TREASON imports betraying, treachery, or breach of faith. It therefore happens only between allies. For treason is indeed a general appellation made use of by the law, to denote not only offences against the king and government, but also that accumulation of guilt, which arises whenever a superior reposes confidence in a subject or inferior, between whom and himself there subsists a natural, civil, or even a spiritual relation; and the inferior so abuses that confidence, so forgets the obligation of duty, subjection, and allegiance, as to destroy the life of any such superior. And therefore, if a wife, kill her husband; a servant, his master; these breaches of domestic faith are denominated *petit treason*. But when disloyalty so rears its crest, as to attack even majesty itself, it is called, by way of distinction, *high treason*.

High treason is considered as the highest civil crime any man, as a member of the community, can possibly commit. By the ancient common law there was a great latitude left in the breast of the judges, to determine what was treason or not: but to prevent arbitrary constructions, a statute of Edward III. defined what offences only are high treason. It deems as such, "When a man doth compass or imagine the death of our lord the king, or our lady the queen, or their eldest son and heir, &c." The *punishment* of high treason is solemn and terrible. 1st. The offender is to be drawn to the gallows and not to be carried or walk, though usually, (by connivance, at length ripened by humanity into a law) a sledge or hurdle is allowed to preserve the offender from the extreme torture of being dragged on the ground or pavement. 2d. He is to be hanged by the neck, and then cut down alive. 3d. His entrails are to be cut out and burnt, while he is alive. 4th. His head is to be cut off. 5th. His body is to be divided into four parts, &c. The king may, and often does remit all the punishment, except beheading, especially where any of noble blood is attainted. In trials for high treason great care is taken that the evidence be full and complete, so that, the punishment being so terrible, no doubt should be left as to the justice of the conviction. In case of *coining*, which is treason of a different complexion, the punishment is milder, being only to be drawn and hanged by the neck till dead. Of late the statute of Edward III.

has been considerably extended, so as to include offences not before deemed treason.

Petit treason is when a servant kills his master; a wife, her husband; or an ecclesiastical person his superior. A servant who kills his master whom he has left, upon a grudge conceived against him during his service, is guilty of petit treason: for the traitorous intention was hatched while the relation subsisted between them. So, if a wife be divorced, and should kill such divorced husband, she is a traitress. The *punishment* of petit treason in a man is to be drawn and hanged; for a woman, it was to be drawn and burnt. Which latter punishment seems to have been handed down to us from the Druids, who condemned a woman to be burnt for murdering her husband; with whom it was the usual punishment for all sorts af treason committed by the female sex. But this barbarous law is repealed, women for this crime being now punished like men. Persons guilty of petit treason are punished with death, as are also their aiders, abettors, and counsellors.

BURGLARY has been always deemed a heinous offence. It may be defined *nocturnal housebreaking*. The law has so tender a regard for the safety of a man's house, that it styles it his castle, and will never suffer it to be violated with impunity. Sir Edward Coke's definition of a burglar is, "he that by night breaketh, and entereth into a mansion house, with intent to commit a felony." In this definition there are four things; the *time*, *place*, *manner*, and *intent*. Burglary is a *felony*.

MURDER, or *Wilful Murder*, in law, is the act of killing another with violence and injustice; in order however to constitute the crime of *wilful murder*, proof is necessary that the criminal designed, before meeting his victim, to destroy him: destroying a person in a sudden quarrel without what has been termed malice prepense, i. e. deliberate malice, is called *manslaughter*. The punishment for wilful murder, in this country, is invariably death; and the person who is guilty of it is to be executed the next day but one on which he is found guilty, unless the same shall be on a Sunday, and then, he is to be executed on the Monday following.

MANSLAUGHTER is a species of felonious homicide, and denotes the unlawfully killing a man, without any malice, either express or implied; which may be voluntarily, upon sudden heat; or involuntarily, but in the commission of some unlawful act. As when two persons, who before meant no harm to one another, falling out upon some sudden occasion, the one kills the other, this is manslaughter; but in this and every case of homicide upon provocation, if there be a sufficient time for passion to subside, and the person provoked afterwards kill the other, this is deliberate revenge, and amounts to wilful murder.

FORGERY, the crime of writing some one's name, or of fabricating some instrument for the purpose of defrauding some one of money or of property. Forgery has for a long time in this country been punished with death. But some recent cases having very much excited the public attention, it seems very probable that our laws concerning this crime will at no distant period be revised and mitigated.

The *Setting* of SPRING GUNS, MAN TRAPS, and other engines calculated to destroy human life, or inflict grievous bodily harm,

except in dwelling houses for the protection thereof, is, by an act passed in 1827, a misdemeanor.

HABEAS CORPUS, in law, is a writ, which a man (indicted and imprisoned for any crime, or trespass, before the justices of peace, or in a court of franchise; and having offered sufficient bail, which is refused, though the case be bailable) may have out of the King's Bench, to remove himself thither, at his own costs, to answer his cause at that bar. The order in this case is, first to procure a writ of *certiorari* out of the Chancery, directed to the said justices for removing the indictment into the King's Bench; and upon that, to give this writ to the sheriff, for causing his body to be removed at a certain day. *Habeas Corpora* is also a writ for bringing in a jury, or so many of them, as refuse to come upon the *venire facias*, for the trial of a cause to be brought to issue. But the most important object of this writ is, when a man is imprisoned illegally, or detained in prison longer than is necessary without being brought to trial. In either of these cases, the prisoner demands of right from the judges a writ of *Habeas Corpus*, enjoining the person who has him in custody to bring him before them without delay, that they may inquire into the cause of his being detained, and set him at liberty immediately if it be unjust, or order him to be put on his trial forthwith. This is the great palladium of English liberty; but ministers sometimes, and upon peculiar emergencies, obtain an act of parliament to suspend it.

SUMPTUARY LAWS are laws made to restrain excess in apparel, costly furniture, eating, &c. Most ages and nations had their sumptuary laws; but it is observed that no laws are worse executed. The sumptuary laws of the ancient Locrian legislator, Zaleucus, are famous: by these it was ordained, that no woman should be attended by above one maid in the street, except she was drunk; that she should not go out of the city in the night, unless she went for base purposes: that she should not wear any gold or embroidered apparel, unless she purposed to be a common woman. That men should not wear rings or tissues, &c. The English also have had their share of sumptuary laws, though they are now either all repealed by a statute, 1st Jac. I., or obsolete.

PLAINTIFF, in law, he that *sues*, or *complains* in an action, whether of *debt*, *trespass*, *deceit*, or the like.

DEFENDANT, the person complained of.

BENEFIT OF CLERGY had its rise in the pious reverence which the first Christian princes paid the church in its infant state; and was intended to exempt the clergy from being criminally proceeded against by lay judges. Popish ecclesiastics soon made an ill use of this, for they afterwards claimed this indulgence, not only for themselves, but for all attendants upon the church, and at length for all who could read; reading being a mark of great learning in those days, and few but ecclesiastics being able to read fluently. Henry VIII. made a distinction between laymen and clergymen; the former, for crimes deserving death, were to be burned with a hot iron on the left thumb; and the privilege to be, on a second time, refused them: both men and women, however, obtained the indulgence. Clergymen, when found guilty of such crimes as claim the benefit of clergy, were not to be burnt in the hand, but immediately discharged: peers, when found guilty, were also discharged by benefit of clergy, without burning; but for the second offence were, like

a layman, to suffer death. By an act passed in 1827 benefit of clergy was abolished; and by the same act it is provided that no person convicted of felony shall suffer death unless it be for some felony which was excluded from the benefit of clergy before or on the first day of the then session of parliament, or which hath been or shall be made punishable with death by some statute passed after that day.

JURISPRUDENCE is the science of what is just and unjust, or of the *laws, rights, customs, statutes, &c.*, necessary for doing justice; it is, in short, the science of law. *Civil jurisprudence* is that of the Roman law; *canonical*, that of the canon law; and *feudal*, that of the feudal law.

Tithes.—Freehold.—Magna-Charta, &c.

TITHES are defined to be the tenth part of the yearly profit arising and renewing from lands, the stock upon lands, and the personal industry of the inhabitants. Tithes were originally designed as a support for the clergy; and many of them are still so applied; but many lay persons are also impropriators or owners of tithes. The first species, being usually called *predial*, as of corn, grass, hops, and wood: the second, *mixed*, as of wool, milk, pigs, &c., consisting of natural products, but nurtured and preserved, in part, by the care of man; and of both these the tenth must be paid in gross: the third, *personal*, as of manual occupations, trades, fisheries, and the like; and of these, only the tenth part of the clear gains and profits is due. *Upon the first introduction*, though every man was obliged to pay tithes in general, yet he might give them to what priests he pleased, which was called *arbitrary consecration of tithes;* or he might pay them into the hands of the bishop, who distributed among his clergy the revenue of the church, which were then in common. But when dioceses were subdivided into parishes, the tithes of each parish were allotted to its own particular minister; first by common consent, or the appointments of lords of manors; and afterwards by the written law of the land. A *modus decimandi*, commonly called by the simple name of *modus* only, is where, by custom, a particular manner of tithing is allowed, different from the general law of taking tithes in kind, which are the actual tenth part of the annual produce. This is, sometimes, a pecuniary compensation, at so much per acre for the tithe of land; sometimes it is a compensation in work and labour, as, that the parson shall have only the twelfth cock of hay, and not the tenth, in consideration of the owner's making it for him; sometimes, in lieu of a large quantity of crude and imperfect tithes, the parson shall have a less quantity when arrived at greater maturity, as a couple of fowls instead of tithe eggs, and the like. Any means, in short, whereby the general law of tithing is altered, and a new method introduced, is called a *modus decimandi*, or special manner of tithing. Tithes are commonly distinguished into *great* and *small;* the *great tithes* being those mentioned above under the name of predial, the *small tithes* including all those of inferior value. A *rectory* is a church-living where the incumbent or clergyman receives all the tithes both great and small; he is called the *Rector.* A *vicarage* is where the incumbent only receives the smaller tithes, and is called the *Vicar.*

MORTMAIN is the alienation of lands and tenements to any cor-

poration or fraternity, and their successors, as bishops, parsons, vicars, which could not be done without the king's licence, and that of the lord of the manor; or of the king alone, if it be immediately holden of him. When popery was the established religion in this country, it was customary for the monks to persuade persons, on their death beds, to leave a part of their property to the monastery to which they belonged; they thus became proprietors of very considerable estates. To prevent this, many laws have been made from time to time; and no person can now leave, by will, any sum of money to a charitable use, unless it be bequeathed and enrolled in chancery twelve months before the death of the testator.

MORTGAGE is an obligation, whereby lands or tenements of a debtor are pawned or bound over to the creditor, for money or other effects borrowed, peremptorily to be the creditor's for ever, if the money be not repaid at the time agreed on. He who borrows the money is called the mortgagor, and he that lends it the mortgagee. Henry VIII. prohibited excessive interest or usury. Though a mortgage is considered as forfeited, and the estate absolutely vested in a mortgagee, in case of failure of payment; yet the mortgagor may, in any reasonable time, recal and redeem his estate, paying the mortgagee his principal and interest, and expenses; for otherwise, in strictness of law, an estate worth 1,000*l.* might be forfeited for the non-payment of 100*l.*, or a less sum.

FREEHOLD is land or a tenement which a man holds in fee-simple, fee-tail, or for life. Freehold is of two kinds, in *deed* and in *law.* The first is the real possession of land or tenement, in fee, fee-tail, or for life; the other is the right a man has to such land or tenement before his entry or seizing. Whatever is part of the freehold goes to the heir; and things fixed thereto may not be taken in distress for rent, or in execution, &c. Freehold estates of certain value are required to qualify members of parliament, and some electors; and also some jurors, but not all, the law having been materially altered lately in regard to jurymen. A person to be qualified for electing knights of the shire in parliament must have a freehold of not less than the annual value of forty shillings.

COPYHOLD is a tenure for which the tenant has nothing to shew but the copy of the roll, made by the steward of the lord's court. The steward of the court is, among other things, to enrol and keep a register of all such tenants as are admitted to any parcel of land, or tenement, belonging to the manor; and the transcript is called the copy of the court roll, which the tenant keeps as his own evidence. Copyholders, upon admittance, pay a fine to the lord; which fines are in some manors certain, in others not; but yet, if the lord exceed two years value, the court of Chancery, King's Bench, &c., have, in their several jurisdictions, power to reduce the fine. In many places the copyholds are a kind of inheritance, and termed customary, because the tenant dying, and the hold becoming void, the next of blood, paying the customary fine, as two shillings an acre, or the like, may not be denied his admission. Some copyholders have, by custom, the wood growing upon their own land; and though they hold by copy, are yet accounted a kind of freeholders: lastly, some others hold by common tenure, called mere copyhold. This is the land which the Saxons called *folkland*, as being held *sine scripto*, in contradiction to *bockland* or charter land, *terra ex scripto.* Copyhold land cannot be made at this

day, for the foundation of copyhold is, that it hath been demised, time out of mind, by copy of court-roll. Copyholders are not allowed to vote for knights of the shire.

LEASE, in law, is a letting of lands, tenements, &c., unto another, either for life, a term of years, or at will, for a rent reserved. A lease, when written, is called an indenture. The party who lets a lease is called the *lessor;* and the party to whom it is let, the *lessee.* Leases require a stamp duty in proportion to the rent reserved.

SUBPŒNA, a writ whereby any person under the degree of peerage is called to apear in chancery, in cases where the common law hath made no provision. The name is taken from the words of the writ, which charge the party summoned to appear at the day and place assigned, *subpœna centum librarum*, under the penalty of a hundred pounds. There is also a *subpœna ad testificandum*, for summoning witnesses in other courts, as well as Chancery.

OYES is a corruption of the French *oyez*, hear ye, being a term by which the criers in our courts demand silence or attention, before they make proclamation of any thing.

EXECUTOR, a person nominated by a testator to see his will and testament executed or performed, and his effects disposed of according to the tenor of the will. An executor is either universal, as having the charge and disposal of the whole: or only particular, intrusted with some particular branch thereof. An executor is generally a friend of the deceased, and hence chosen to execute what is there directed. But if the person so appointed refuse to dispose of the effects, and distribute the property, the next of kin may *administer*, that is, apply to the proper court, and take out *letters of administration.* This person is called an *administrator.* This name is also given to the person who administers the effects of a person dying intestate. By the 37th of Geo. III. every person who shall administer the personal estates of any person dying, without proving the will of the deceased or taking out letters of administration within six calendar months after such person's decease, shall forfeit 50*l.* An *assignee* is a person appointed by another to do an act, transact some business, or enjoy a particular commodity.

HEPTARCHY, a government composed of seven persons; or a country governed by seven persons, or divided into seven kingdoms. The Saxon heptarchy included all the southern as well as northern parts of England, which were cantoned out into seven petty kingdoms. It subsisted from the year 428 to 825, when king Egbert united them in one, and made the heptarchy into a monarchy.

FEUDAL SYSTEM.—The word *feud* is used in the north of England and Scotland for a combination of kindred, to revenge the death of any of their blood. Under the feudal system men were at the will of their lord: for a manor consisted of a certain extent of land, the usual residence of the owner, who, keeping a part for himself, distributed the rest among his tenants or vassals, who, for the use of the land, consented to do whatever the lord of the manor commanded them. Under the feudal system, estates in land were at will; afterwards for life, and were called *beneficia;* and for this reason, the livings of clergymen are so called at this day.

VASSAL, in our ancient customs, a person who vowed fidelity and homage to a lord, on account of some land, &c., which he held of him in fee. The vassal was also called *piratus*, *lord's man*, and *fee*

man; but now the denomination is changed into that of tenant in fee. If a vassal offended his lord grievously, either in person or honour, he committed the crime of felony, which carried with it a confiscation of his fee. Vassal was also anciently used for soldier, as fees at first were given to none but military men.

MAGNA CHARTA; the great charter of liberties, granted in 1215, the 16th year of king John, and confirmed by Edward I. The reason of its being termed *magna*, or *great*, is, either because of the excellency of the laws and liberties therein contained: or because there was another charter, called *charta de foresta*, established with it, which was the less of the two; or because it contained more than other charters; or on account of the wars and troubles in the obtaining of it, or of the great and remarkable solemnity in the denouncing of excommunications against the infringers of it. Magna Charta may be said to derive its origin from Edward the Confessor, who granted several liberties and privileges, both civil and ecclesiastical, by charter: the same, with some others, were also granted and confirmed by Henry I., by a celebrated great charter, now lost. And his successors, Stephen, Henry II., and finally, John, confirmed or re-enacted the same: but this last prince violating his charter, the barons took up arms, and his reign ended in blood.—Henry III., who succeeded him, after having procured an inquisition to be made by twelve men in each county what the liberties of England were in the time of Henry I., renewed the great charter granted by John, which he several times confirmed, and as often broke again; till in the 37th year of his reign he came to Westminster-hall, where, in the presence of the nobility and bishops, with lighted candles in their hands, Magna Charta was read, the king all the while laying his hand on his breast, and at last solemnly swearing, faithfully and inviolably to observe all things therein contained, as a man, a Christian, a soldier, and a king. Then the bishops extinguished their candles, throwing them on the ground, crying, 'thus let him be extinguished and stink in hell, who violates this charter.' Magna Charta was thought to be so beneficial to the subject, and a law of so great equity in comparison with those which were formerly in use, that king Henry, for restoring it, had the fifteenth penny of all the moveable goods, both temporal and spiritual. Sir Edward Coke observes, Magna Charta has been above thirty times confirmed.

PRAGMATIC SANCTION, in the civil law, is defined, by Hotoman, a rescript or answer of the sovereign to a body of people, upon their consulting him on some case of their community.

The term 'Pragmatic Sanction' is applied chiefly to a settlement of Charles VI., emperor of Germany, who, in the year 1722, having no sons, settled his hereditary dominions on his eldest daughter, the archduchess Maria Theresa; which was confirmed by the diet of the empire, and guaranteed by Great Britain, France, the States-General, and most of the powers of Europe.

ORDEAL, ORDALIUM, a form of trial for discovering innocence or guilt, practised in England in the time of Edward the Confessor, and, since, as late as the reigns of king John and Henry III. The word, in the original Saxon, signifies a *great judgment*, formed of *or*, great, and *deal*, or *dele*, judgment. The practice of ordeal did not only prevail in England, but also in France and Germany; it was condemned by pope Stephen II., and abolished by a

declaration of Henry III. The ordeal was of various kinds, *viz.* of fire, red hot iron, cold water, judicial pottage, hallowed cheese, boiling water, green cross, and dice laid on relics covered with a woollen cloth. There were particular masses for each species of ordeal. It is a popular story in our histories, that Emma, mother of Edward the Confessor, being accused of too much familiarity with the Bishop of Leicester, demanded the ordeal of red hot iron, and passed barefooted and hoodwinked over nine red hot ploughshares, without touching any of them.

DOMESDAY-BOOK, the judicial book, or book of the survey of England; a most ancient record, made in the time of William the Conqueror, upon a survey, or inquisition, of the several counties, hundreds, tithings, &c. Its name is said to be formed from the Saxon *dom*, doom, judgment, sentence; and *day*, which has the same force. The design of the book is, to serve as a register, by which sentence may be given in the tenures of estates; and from which that noted question, whether lands be ancient demesne, or not, is still decided. Its contents are summed up in the following verses:

——Quid deberetur fisco, quæ, quanta, tributa,
Nomine quid census, quæ vectigalia, quantum
Quisque teneretur feodali solvere jure,
Qui sunt exempti, vel quos angaria damnat,
Qui sunt vel glebæ servi, vel conditionis,
Quove manumissus patrono jure ligatur.

This book is still remaining in the Exchequer, fair and legible, consisting of two volumes, a greater and a less; the greater comprehending all the counties of England, except Northumberland, Cumberland, Westmoreland, Durham, and part of Lancashire, which were never surveyed; and Essex, Suffolk, and Norfolk, which are comprehended in the less volume. It is called *Liber Judiciaris*, because a just and accurate description of the kingdom is contained therein, with the value of the several inheritances, &c. Our ancestors had many *Dome-books*. We are told by Ingulphus, that king Alfred made a like register with that of William the Conqueror.

A DIET is an assembly of princes or statesmen, to deliberate and concert measures, or pass laws for the public good. The diets of the Empire of Germany were commonly held at Ratisbon. But this empire no longer existing, the diets have ceased to exist of course. In Poland there were likewise diets on horseback, held in the country. Such were those, wherein they chose their king. There were likewise diets held in Switzerland; diets of the Protestant cantons, diets of the Catholic cantons, and general diets. In Sweden, the assembly of the legislative authorities is called a diet.

SHIRE.—Scyra, a part of land, called also *county*. The word is originally Saxon, *scir*, or *scire*, formed from *scyran*, to divide. King Alfred first divided the land into *satraptas*, which we now call *shires;* and these into *centurias*, which we call hundreds.

County originally signified the territory of a *count*, or *earl*, but now it is used in the same sense with *shire*, the one word coming from the French, the other from the Saxon; in this view, a county is a circuit or portion of the realm, into fifty-two of which, the whole land, England and Wales, is divided, for its better government and the more

easy administration of justice. For the execution of the laws in the several counties, every Michælmas term officers are appointed under the denomination of sheriffs.

CITY, in this country, is a populous town, usually the capital of some county, province, or district, and the see of an archbishop or bishop. Cities and villages were held, in the time of the feudal government, of some great lord, on whom they depended for protection, and to whose arbitrary jurisdiction they were subject. But the freedom of cities was first established in Italy, towards the beginning of the fourth century, in consequence of the prevalence of commerce: and it was thence introduced into France and other countries. This establishment of communities contributed much to introduce regular government, police, and arts, and diffuse them over Europe. The term *city* has had its rise among us since the Conquest: for in the time of the Saxons there were no cities so called, all great towns being called burghs. Thus London was called Lunden burgh: and for a long time afterwards city and burgh were used indiscriminately for a large town. The cities, so called, in England are twenty-four, in Wales four.

BOROUGH, or BURG, is frequently used for a town or a corporation, which is not a city. Borough, in its original Saxon, *borge*, or *borgh*, is by some supposed to have been primarily meant for a company consisting of ten families, who were bound and combined together as each other's pledge. Afterwards, Verstegan says, borough came to signify a town that had something of a wall or enclosure about it: so that all places, which among our ancestors had the denomination borough, were one way or another fenced or fortified. Borough, or burgh, is now particularly appropriated to such towns and villages as send burgesses or representatives to parliament. Boroughs are equally such, whether they be incorporate or not: there being great numbers of our English boroughs not incorporated; and on the contrary, several corporations that are not boroughs. Boroughs are distinguished into those by charter, or statutes; and those by prescription, or custom. The number of boroughs in England and Wales is 214; some of them send one, but most of them two representatives, to parliament.

Royal Boroughs, in Scotland, are corporations made for the advantage of trade, by charters granted by several of their kings; having the right of sending commissioners to represent them in parliament, beside other peculiar privileges. These form a body of themselves; and each sends commissioners to an annual convention at Edinburgh, to consult the benefit of trade, and the general interests of the boroughs. The company of merchants in a royal borough makes what is called a *gild*.

Borough-English denotes a customary descent of lands or tenements in certain places, by which they come to the youngest instead of the eldest son; or, if the owner have no issue, to the youngest, instead of the eldest brother: for the youngest is supposed, in this law, least able to provide for himself.

Borough-Head, or Head-Borough, is the chief man of the decenna, or hundred, who is chosen by the rest to speak and act in their behalf.

Borough-Courts are certain courts held in boroughs by prescription,

charter, or acts of parliament; such as the sheriff's-court and court of hustings in London.

CORPORATION, a body politic, or incorporate, so called, because the persons, or members, are joined into one body, and are qualified to take and grant, &c. Corporations are either spiritual or temporal; the *spiritual* are bishops, deans, archdeacons, parsons, vicars, &c.; the *temporal* are those of mayor, commonalty, bailiff, burgesses, &c., and some corporations are of a mixed nature, composed of spiritual and temporal persons, such as heads of colleges and hospitals, &c.; All corporations are said to be *ecclesiastical* or *lay:* ecclesiastical are either regular, as abbey, priories, chapters, &c.; or secular, as bishoprics, deaneries, archdeaconries, &c.: lay are those of cities, towns, companies, or communities of commerce. Corporations may be established either by *prescription*, *letters patent*, or *acts of parliament;* but are most commonly established by patent or charter. London is a corporation by prescription.

FAIRS are well known to be places where merchants, traders, and other persons, meet, on some fixed day, to buy and sell commodities, and partake of the diversions usually accompanying such assemblies; fairs also denote the *people* assembled. The word is formed of the French *foire*, which signifies the same thing: and some derive *foire* from *forum*, market; others from *feriæ*, because fairs were anciently held where wakes or feasts of the dedication of churches, called feriæ, were held. Fairs are established by long and immemorial usage and prescription; or else by virtue of a grant from the king. The duration of fairs is determined by proclamation. Fairs make a very considerable article in the commerce of Europe; especially that of the midland parts, as Germany, &c., where the continual passage and repassage of vessels is impracticable. The fairs in this country were formerly of more importance than they are at present; many of which are become absolute nuisances.

MARKETS are for the purpose of exposing provision of various kinds and other commodities to sale. In former times it was customary to have most fairs and markets kept on Sundays, and in the churchyard, so that matters of business and devotion were transacted under one: which custom, though prohibited by several kings, prevailed till the reign of Henry VI., when it was effectually suppressed. In many places, they are still kept in the chuchyard, and in Catholic countries on Sundays.

PARISH.—Judge *Blackstone* says, that the boundaries of parishes were originally ascertained by those of a manor, or manors; because it very seldom happens, that a manor extends itself over more parishes than one, though there are often several manors in one parish. As Christianity spread, the lords began to build churches within their own demesnes, to accommodate their tenants; and, in order to have divine service regularly performed in them, obliged all their tenants to appropriate their tithes to the maintenance of the minister; and this tract of land formed a distinct parish. This will account for the frequent intermixture of parishes one with another: for if a lord had a parcel of land detached from the main of his estate, but not sufficient to form a parish of itself, it was natural for him to endow his newly-erected church with the tithes of such lands. Camden reckoned nine thousand two hundred and eighty-four parishes in England; and Chamberlayne makes at present nine thousand nine

hundred and thirteen. A parish is therefore defined, the precinct or territory of a parochial church, or the circuit or ground which the people inhabit. The *boundaries* of parishes are still preserved by certain land and other marks; and to keep these always in remembrance, it is usual in some parishes, for a number of parishioners, old and young, to walk round these boundaries once a year; in others, once in three years, and in others, at uncertain periods.

HUNDREDS.—Counties are divided into hundreds, and hundreds are again divided into tithings. The *tithings* were, as it is supposed, so called, because composed of ten freeholders and their families; and ten tithings were called a hundred, because composed of ten times ten families; for when Lambard tells us, that a hundred is so called *a numero centum hominum*, it must be understood of a hundred men, who are heads and chiefs of so many families. Hundreds were first instituted by king Alfred; he borrowed the title from Germany. See Riding.

By various acts of Parliament, particularly those called *Hue and Cry*, and the *Black Act*, individuals injured in their property by rioters, &c. were to be reimbursed by the hundred in which the loss occurs. The statutes of Hue and Cry and the Black Act were repealed, and an act for consolidating and amending the laws in England relative to remedies against the hundred, was passed in 1827.

The MAYOR of any place is the king's lieutenant, and, with the alderman and common council, can make laws, called *by-laws*, for the government of the place. He has also the authority of a kind of judge, to determine matters, and mitigate the rigour of the law. Richard I. first changed the bailiffs of London into Mayors, by whose example others were afterwards appointed. Mayors of corporations are justices of the peace for the time being. Till lately, no one could bear the office of mayor, who had not received the sacrament according to the rites of the Church of England within one year before his election. But by the 9 Geo. IV. c. 17., so much of the acts, usually called the TEST and CORPORATION ACTS, which required such sacrament to be received, before admission to *state* or *corporate* offices, was repealed, and, in lieu of which, a *declaration* must now be made and subscribed by the persons taking such offices, importing *that they will not exercise their power to injure or weaken the Protestant Church, &c.* A mayor must also take the oaths of supremacy. By supremacy is meant the *superiority of the king* over the *church* as well as *state* of England. The mayor is the *chief magistrate* or governor in a city. Many of the *corporation towns* in England have mayors. The mayors of London and York are the only two, who bear the title of *Lord*.

The SHERIFF has two functions; one *ministerial*, to execute all processes and precepts of the courts of law directed to him; the other *judicial*, by which he holds two courts: the *turn*, or *sheriff's turn*, and the *county court*. The sheriff is considered as the chief gaoler, and has the custody of criminals and delinquents. He is, during his office, the first man in the county, and ranks before every nobleman in it. The sheriff is appointed by the king from among the gentlemen *resident in the county*. It is his duty to execute sentence on all criminals himself, or find some one to do it for him.—There are two sheriffs chosen for the city of London, by the citizens themselves, who act for it and the county of Middlesex jointly. The sheriff is, as it

were, the soul of the police of the county, and the preserver of the peace. His office lasts only one year. He collects the revenues, fines, confiscations, &c., arising in his county, for which he accounts to the Exchequer; he also attends and assists the itinerant judges.

CORONER, an, officer, whose business is, to inquire, by a jury of twelve neighbours *how*, *and by whom, any person came by a violent or sudden death;* and enter the same upon record. This being a matter criminal, and a plea of the crown, he is hence called a crowner, or coroner. There are usually two coroners for every county; but in some counties more. They are chosen by the freeholders of the county, by virtue of a writ out of Chancery. The lord chief justice of the King's Bench is the sovereign coroner of the whole realm. Coroners are chosen for life, unless they become sheriffs or verderors, or are discharged by a writ, for extortion, neglect, or misbehaviour. A part of their judicial authority is, to inquire of lands or goods, and escapes, murderers, treasure-trove, wreck of the sea, deodands, &c.; and in their ministerial power they executed the king's writs, on exception to the sheriff.

BAILIFF.—As the realm is divided into counties, and every county into hundreds, the people, in ancient times, had justice administered to them by officers of every hundred. But now the hundred-courts are commonly included in county-courts, and the bailiff's name and office are grown into less repute. Bailiffs are now generally those officers who serve writs, &c., though, in other respects, the word is still applied to the chief magistrate in many towns and boroughs, as the *High Bailiff* of *Westminster*, and sometimes the persons to whom the king's castle is committed, as the bailiff of Devon Castle. Bailiffs of hundreds collect fines, summon juries, &c. There are other kinds of *bailiffs*, as *of manors, forests, &c.,* who are directors in matters of husbandry. *Water-Bailiffs* are appointed in port-towns for the searching of ships, gathering the tolls for anchorage, &c.

SCEPTRE is an ensign of royalty and authority. The sceptre, in its original state, was a spear. Neptune's sceptre is his trident; and the gods of the ancients were represented with a kind of sceptres. The Greek and other poets put sceptres into the hands of the kings which they introduced. A sceptre is a kind of royal staff, still borne, on solemn occasions, by kings. A MACE is also an emblem of authority; and is carried before magistrates.

OLD TERMS.—*Wold* signifies an open ground; plain or hilly down, and void of wood. Hence the names Stow on the Wold, and Cotswold, in Gloucestershire; and the Wold in Leicestershire. *Hyth* means a small haven, port, or wharf to land wares at. Such as Queen-hythe. *Wick* or *wic*, in the original Saxon, signified a village, street, dwelling-place, or castle. So *Lunden-wic*, signified London-town. *Wic* sometimes denotes a place on the sea-shore, or on the banks of a river.

RIDING is contracted from *Trething*, *Trithing*, or *Triding*, and signifies the third part of a county, or three or more wapentakes or hundreds. Such sort of portions are the *Lathes* of Kent, the *Rapes* of Sussex, and the *Ridings* of Yorkshire. Those who governed these portions of a county or shire were called *Trithing-reeves;* before whom were brought all causes, that could not be determined in the hundreds or wapentakes. *Wapentake*, in the northern counties, is synonymous with *hundred;* and was governed by a high constable

or bailiff. Formerly there was held in it the hundred-court for the trial of causes. TITHINGS originated in the decimal divisions adopted by the Romans. In ancient times it was ordained, for the preservation of the peace, that all freeborn men should form themselves into several companies, of ten in each company; and that every one of these ten men should be surety and pledge for the forthcoming of his fellows. Hence the districts occupied by these companies were called *tithings;* and as ten of these adjoining companies were appointed to meet at certain times for matters of great weight, their general assembly was called a HUNDRED. The same appellation was extended to the particular district or portion of a county, which these companies occupied; and Tithings and Hundreds finally became the names of subdivisions and divisions of lands, as *decemviri* and *centumviri* signified 10 and 100 magistrates at Rome. *Soke, Sok, Soc,* or *Soca,* signifies the power of administering justice, and the territory or precinct in which the chief lord exercised his soke, his liberty of keeping court or holding trials within his own soke or jurisdiction. Such are the sokes of Lincolnshire. *Ward* is used in the northern counties as synonymous with hundred. It is derived from the circumstance of the inhabitants of each division being in ancient times obliged to keep watch or *ward* against the irruptions of the Scots and Picts. *Liberty* and *Franchise* were applied to certain districts having peculiar privileges and immunities; such as, freedom from arrests for debts contracted out of the liberty, &c. The liberties of Shrewsbury, franchises of Wenlock, &c., are divisions of the county of Salop, similar to hundreds. See HUNDRED, above.

COMMERCIAL AFFAIRS.

TRADE and COMMERCE, as generic words are synonymous, implying the exchange of commodities; or the buying, selling of or trafficing with merchandise or money, in order to profit by it. In a more restricted sense, *Trade* implies the practice of some handicraft, thus, we say the trade of a carpenter, a weaver, &c. &c.

There is no doubt, that commerce is nearly as ancient as the world itself: necessity gave it birth; the desire of conveniency improved it; and vanity, luxury, and avarice, have brought it to its present state. At first it consisted only in the exchange of things necessary for life; the ploughman gave his corn and his pulse to the shepherd, and received milk and wool in exchange. This method of commerce by exchange subsists still in many places; as about the coasts of Siberia, and in Danish and Muscovite Lapland; among several nations on the coast of Africa; among most of those in America, and many in Asia. Among the ancients commerce did not appear unworthy the application of persons of the first rank; Solomon, we are told, frequently joined his merchant-fleets to those of the king of Tyre, for their voyage to Ophir; and, by this means, rendered himself, though in a small kingdom, the richest king in the universe. Under the Asiatic and Grecian Empires ancient history gives us, from time to time, the traces of a commerce cultivated by several nations; but it flourished more considerably under the dominion of the Romans, as appears from that vast number of colleges and companies of merchants in the several cities, mentioned by historians and ancient inscriptions. The destruction of the Roman empire by

the irruptions of the Barbarians also occasioned that of commerce, or at least suspended its operation for some time; by degrees it began to recover itself and made a new progress, especially in Italy.

In modern times, the Florentines, Genoese, and Venetians, who abounded in shipping, spread through all the ports of the Levant and Egypt; bringing thence silk, spices, and other merchandize, with which they furnished the greatest part of Europe. And thus modern commerce was founded on the ruins of that of the ancient Greeks and Romans to the same places; and thus did those famous republics acquire their lustre and power, while the trade, anciently carried on between the Black and Caspian seas and the East by means of the Danube, entirely declined. The Germans, however, had a long time carried on a separate commerce, which was not borrowed from the Romans, nor did it fall with theirs. Toward the end of the twelfth century, the German cities situate on the coasts of the Baltic and the German ocean, of which Lubec and Hamburgh were the chief, had a considerable traffic with the neighbouring states. As their commerce was much interrupted by pirates, twenty-seven of them united together for their mutual defence; and were thence called *Hanseatic* or HANS TOWNS. They were formerly united in a league of defensive and offensive alliance, which has been entirely destroyed by revolutionary France. Thus they flourished till the end of the fifteenth, or beginning of the sixteenth, century; when, a division arising among them, and about the same time a new passage to the Indies by the Cape of Good Hope being discovered by the Portuguese, and settlements made on the coasts of Africa, Arabia, and the Indies, the ancient Italian and Hanseatic commerce sank, and the chief trade came into the hands of the Portuguese.

The Portuguese had not possessed these different trades above a hundred years, when, about the beginning of the seventeenth century, the Dutch began to share it with them; and in a little time dispossessed them of almost the whole. The English, French, Danes, and Hamburghers, excited by their success, have likewise made settlements in the Indies, and on the coast of Africa, though much less considerable ones, excepting those of the English. Lastly, America discovered by the Spaniards soon after the Portuguese had discovered the new way to the Indies, likewise became the object of a new, vast, and important commerce for all the nations of Europe, whereof Cadiz and Seville were made the centre. Of all the nations in Europe, the English and Dutch, previously to the French revolution, had the superiority in point of trade.—As to Britain, the convenience and multitude of her ports, the variety and goodness of her commodities, the industry and ingenuity of her workmen, &c., have established such a trade as scarcely to admit of any rival. At the present time, this country trades to all parts of the world; nor has any country or nation such a commerce with her own commodities as Great Britain.

The TRADE of this country with foreign nations is carried on partly by companies, and partly by private merchants. The most considerable companies that have been formed are the following:

The most ancient trading company in Britain was the *Hamburgh Company.* They were originally called Merchants of the Staple, and afterward, Merchant Adventurers. They were first incorporated in the reign of King Edward, anno 1296, and obtained leave of John, duke of Brabant, to make Antwerp their staple or mart,

where the woollen manufactures at that time flourished. The company next incorporated was that of the *Russia Merchants*, in the reign of queen Mary, who were empowered to trade to all lands, ports, and places in the dominions of the emperor of Russia. The *Eastland Company*, formerly called Merchants of Elbing, a town in Polish Prussia, being the port they principally resorted to in the infancy of their trade. They were incorporated the 21st of the reign of queen Elizabeth, and empowered to trade to all places within the Sound, except Narva, the only Russian port at that time in the Baltic. This company, like the former, is not considerable; the trade to Norway and Sweden being laid open to private merchants by act of parliament. The *Turkey* or *Levant Company* was also erected in the reign of queen Elizabeth, and its privileges confirmed and enlarged in the reign of king James I, being empowered to trade to the Levant, or eastern part of the Mediterranean; particularly to Smyrna, Aleppo, Constantinople, Cyprus, Tripoli, Alexandria, &c. This trade is also now laid open to private merchants, upon paying a small consideration.

The *East India Company* was incorporated about the 42d of queen Elizabeth, anno 1600, and empowered to trade to all countries to the eastward of the Cape of Good Hope, exclusive of all others. But about the year 1698, application being made to the parliament by private merchants for laying this trade open, an act passed, empowering every subject of England, after raising a sum of money for the supply of the government, to trade to these parts. Upon this a great many subscribed, and were called the New East India Company. But the old company being masters of all the forts on the coasts of India, the new company found it their interest to unite with them, and trade with one joint stock, and have been ever since styled the *United East India Company*. In 1813 an Act of Parliament was passed, allowing private merchants to trade on their own account to all parts of India, except China, in vessels of not less burden than 400 tons.

The *East India Company's* House, a fine building, in Leaden-hall Street, contains not only accommodation for the transactions of their multifarious business, but it has also a splendid museum of all that is rare and curious in the Natural History and Arts of the East; it has besides a valuable library; the present learned librarian is Dr. WILKINS.

The *Royal African Company* was incorporated 14th Charles II., and empowered to trade from Sallee, in South Barbary, to the Cape of Good Hope, and erect forts and factories on the western coast of Africa for this purpose. But this trade was laid open by act of parliament, anno 1697, and every private merchant permitted to trade thither, upon paying 10*l.* toward maintaining the forts and garrisons: this company, for securing its commerce, erected several forts and factories on the coast. The *Canary Company* was also incorporated in the reign of King Charles II., anno 1664, and empowered to trade to the Seven Islands, anciently called the Fortunate, and now the Canary Islands. The *Hudson's Bay Company* dates from the same reign, anno 1670, and trades to Hudson's Bay, from which the company takes its name, and the adjacent places. It makes a very advantageous trade, by exporting woollen goods, haberdashery wares, knives, hatchets, and other hardware; and in return bringing back

skins, beaver, and furs. The *South Sea Company* was established in the 9th of queen Anne; but this company has long given up its commercial undertakings as *a corporate* body.

Many other trading companies exist in this country; some of them are both numerous and respectable, but it will exceed our limits to enter into detail concerning them; we may mention, however, that BANKING and INSURANCE Companies are among those of the greatest respectability; the first facilitate money transactions, and the others secure property from loss or damage by fire, the sea, &c. and also grant annuities on lives. See forwards.

The EXPORTS and IMPORTS of Great Britain are so complex and variable, that it would be impossible, in this work, to give a competent idea of them.—The exports, or goods sent out of the country, consist principally of woollen, linen, and cotton cloths, manufactured iron, tin, brass, leather, hardware, &c. and the surplus produce of our East and West India Colonies, North and South Fisheries, &c. The imports, or goods brought from foreign countries, are principally unwrought iron, antimony, silver, timber, hemp, flax, tallow, oil, gold-dust, ivory, gum, drugs, tea, silks, diamonds, coffee, currants, figs, spirits, wines, sugar, rum, cotton, indigo, cacao, fruits, gold bullion, &c. The value of the exports from this country, including our home productions and imported commodities, was some time since nearly sixty millions sterling; and it is presumed is not much less at the present time; in the year 1792 it was only twenty-four millions.

FUND is a word used in commerce for the capital stock of a mercantile company, or corporation; or the sum of money that they put into trade. *Funds* mean also money borrowed by parliament, to defray the national expenses, when the taxes are insufficient for the purpose, as is the usual case in time of war. Fresh taxes are laid on, or old ones increased, to pay the interest of the money thus borrowed; and these taxes are generally calculated to produce more than the interest, that a surplus may remain, gradually to pay off the principal. This surplus is called a *sinking fund.* These funds (consisting, in common language, of the *four, three and a half, and three per cents, annuities,* &c.) and the joint stock of the Bank, East-India, and South-Sea companies are included in what we call the *Public Funds*, or *The Funds* merely; and, when we would exclude those of the companies, we say the *Government Funds.*

A BANK, in commerce, signifies a repository, established by one or more individuals, where many persons place their money, to be always ready at their call or direction, the bankers taking the charge of it, either to improve it, or to keep it secure. The first institution of banks was in Italy, where the Lombard Jews kept benches in the market-places for the exchange of money and bills; and *banco* being the Italian name for *bench*, banks took their title from this word. Banks are chiefly of two kinds: either *public*, consisting of a company of monied men, who, being duly established and incorporated by the laws of their country, agree to deposit a considerable fund, or joint stock, to be employed for the use of the society, as lending money upon good security, buying and selling bullion, discounting bills of exchange, &c.; or *private, i. e.* set up by private persons or partnerships, who deal in the same way as the former, but upon their own single stock and credit.

The Bank of England is the greatest bank of circulation in Europe; it was incorporated by parliament, in the fifth and sixth years of king William and queen Mary, by the name of the Governor and Company of the Bank of England, in consideration of a loan of 1,200,000*l.* granted to the government; for which the subscribers received nearly 8 per cent. By this charter, the company are not to borrow under their common seal, unless by act of parliament; they are not to trade in any goods or merchandize; but they may deal in bills of exchange, buying or selling bullion, and foreign gold and silver coin, &c.

The company of the Bank was originally obliged to keep cash sufficient, not only to answer the common, but also any extraordinary demand, that might be made upon them; and whatever money they had by them, over and above the sum supposed necessary for these purposes, they could employ in what may be called the trade of the company; that is to say, in discounting bills of exchange, buying gold and silver, and in government securities, &c. All these advantages render a share in their stock very valuable. The company makes dividends of profits half-yearly, of which notice is publicly given; when those who have occasion for their money may receive it on demand. The company is under the direction of a governor, deputy-governor, and 24 directors, who are annually elected by the general court, in the same manner as those of the East India company. Thirteen compose a court of directors for managing the affairs of the company. The officers of this company are very numerous. The stability of the bank of England is equal to that of the British government. All that it has advanced to the public must be lost, before its creditors can sustain any loss.

By its constitution, as sanctioned by the legislature, no other banking company can be established in England consisting of more than *six* members. But by a late act of parliament this privilege is modified, as new banks, situated more than sixty-five miles from London, may be established with any number of members. In return for this concession on the part of the Bank of England, it has the privilege of establishing *branch banks* of its own in our great commercial towns; there seems, nevertheless, a general feeling in the country against these branch banks; and although several have been established in different places, their policy and permanence appear questionable.

The Bank of England acts not only as a general bank, but as a great engine of state, receiving and paying the greater part of the annuities which are due to the creditors of the public; circulating exchequer bills; and advancing to government the annual amount of the land and malt taxes, which are, frequently, not paid up till some years after. It likewise has, upon several different occasions, supported the credit of the principal houses, not only in England, but of Hamburgh and Holland. Upon one occasion, it is said to have advanced for this purpose, in one week, about 1,600,000*l.*, a great part of it in bullion.

From the year 1797, till lately, the Bank of England was restrained from paying its notes in specie by act of parliament: it issued, however, a large quantity of one and two pound notes; and these, together with its issue of larger notes, amounted, in the year 1817, to the enormous sum of more than twenty-nine millions of pounds sterling. Since which time the Bank has been gradually withdrawing its

issues; all the one and two pound notes have nearly disappeared; and gold is now to be obtained at the Bank as readily as paper. The amount of its notes now in circulation is about twenty-one millions sterling.

In Scotland there are two public banks, both at Edinburgh. The one is called the *Bank of Scotland*, which was established by act of parliament in 1695; the other, called the *Royal Bank*, by royal charter in 1727. Within these fifty years there have also been erected private banking companies in almost every considerable town. Hence the business of the country is almost entirely carried on by paper-currency, *i. e.* by the notes of those different banking companies; with which purchases and payments of all kinds are most commonly made. Silver very seldom appears in Scotland, except in the change of a twenty shilling bank note. It is chiefly in discounting bills of exchange, that is, by advancing money upon them before they are due, that the greater part of banks and bankers issue their promissory notes. They deduct always, upon whatever sum they advance, the legal interest till the bill becomes due. The payment of the bill, when due, replaces to the bank the value of what had been advanced, together with the interest. The banker, who advances to the merchant whose bill he discounts, not gold and silver, but his own promissory notes, has the advantage of being able to discount to a greater amount, by the whole value of his promissory notes, which he finds by experience are commonly in circulation. He is thereby enabled to make his clear gain of interest, on so much larger a sum; but liable to the hazard of loss from the bills discounted not being paid.

Since free trade was granted to Ireland, a *National Bank* has been opened in the city of Dublin, under the firm of the Governor and Company of the Bank of Ireland. The interest of money in that kingdom is 6 per cent per annum, but its sterling currency is at 8 1-4 per cent under the real current coin of Great Britain.

AGIO is an Italian word, importing conveniency, and was used, to signify the difference between the value of current money and bank notes, in Venice and Holland, before the destruction of those banks by the French. Money in banks was commonly worth more than specie; thus, at Amsterdam they gave 103 or 104 florins for every 100 florins in bank. At Venice, the agio was fixed at 20 per cent. Agio was also used for the profit arising from discounting a note, bill, &c.

BULLION is gold or silver in the mass, or uncoined. These metals are called so, either when melted from the native ore, and not perfectly refined, but melted down in bars or ingots: or in any unwrought body, of any degree of fineness.

BANKRUPT, *bankus ruptus*, in law and trade, signifies a breaking, or failing. A bankrupt, from the several descriptions given of him in our statute law, may be defined "a trader, who secretes himself, or does certain other acts tending to defraud his creditors." A bankrupt was formerly considered in the light of a criminal or offender; but at present the laws of bankruptcy are calculated for the benefit of trade, and founded on the principles of humanity, as well as justice; and to this end they confer some privileges, not only on the creditors, but on the bankrupt himself. On the *creditors*, by compelling the bankrupt to give up all his effects to their use, without any fraudulent concealment; on the *debtor*, by exempting him from the

rigor of the general law, though in reality he has nothing to satisfy the debt; so that the law of bankrupts, taking into consideration the sudden and unavoidable accidents, to which men in trade are liable, has given them the liberty of their persons, and some pecuniary emoluments, or a per-centage on their dividends, upon condition that they surrender up their whole estate to their creditors. The laws of England have done wisely in providing both against the inhumanity of the creditor, who is not suffered to confine an honest bankrupt, after his effects are delivered up; and at the same time taking care, that all his just debts shall be paid, so far as the effects will extend. But still, they are cautious of encouraging prodigality and extravagance by this indulgence to debtors: and therefore they allow the benefit of the laws of bankruptcy to none but actual traders; as this set of men are, generally speaking, the only persons liable to incidental losses, and to an inability of paying their debts, without any fault of their own. If persons, in other situations of life, run in debt without the power of payment, they must abide the consequences of their indiscretion, even though they meet with sudden accidents that reduce their fortunes: for the law holds it to be an unjustifiable practice, for any person, not a trader, to encumber himself with debts of any considerable value. If a gentleman, at the time of contracting his debts, have a sufficient fund to pay them, the delay of payment is dishonesty, and a temporary injustice to his creditor: and if at such time he have not a sufficient fund, the dishonesty is the greater. But in mercantile transactions the case is quite otherwise.—Trade cannot be carried on without mutual credit: the contracting of debts is therefore here, not only justifiable, but necessary. And if by the loss of a ship at sea, the failure of brother traders, or the nonpayment of persons out of trade, a merchant or trader become incapable of discharging his debts, it is his misfortune, and not his fault. To the misfortunes, therefore, of debtors the law has given a compassionate remedy, but denied it to their faults; since, at the same time that it provides for the security of commerce, by enacting that every trader may be declared a bankrupt, for the benefit of his creditors as well as of himself, it has also, to discourage extravagance, declared, that no one shall be capable of being made a bankrupt, but a *trader;* or capable of receiving the full benefit of the statutes, but an *industrious trader.*

In the interpretation of the several statutes made concerning bankrupts, it has been held, that buying or selling only will not qualify a man to be a bankrupt; but it must be both buying and selling, and also getting a livelihood by it: as by exercising the calling of a merchant, grocer, mercer, or, in one word, a chapman, who is one that buys and sells any thing: and no *handicraft* occupation will make a man a regular bankrupt. But in practice the law is interpreted very widely, so as to include as many as possible within its operation. It has also been determined expressly, that a banker's stopping, or refusing payment, is no act of bankruptcy, for it is not within the description of any of the statutes; and there may be good reasons for his so doing, as suspicion of forgery or the like; and if in consequence of such refusal, he be arrested and put in bail, still it is no act of bankruptcy; but if he go to prison, and lie there two months, then, and not before, he becomes a bankrupt.

COIN, MATRICE, in the manufacture of money, medals, and

counters, originally signified a piece of steel, well tempered, four or five inches deep, square at the bottom, and round at top, whereon are engraved dentwise, with puncheons and other instruments, the several figures, marks, &c., to be struck on the money, &c. But this is now called a *die*, and the term *coin* is used for the metal thus impressed, or *coined*, to circulate as money. Coin differs from money as the species does from the genus. MONEY is any matter, whether metal, wood, leather, glass, horn, paper, fruits, shells, or kernels, which have circulation as media in commerce. Coins are a particular species of money, *viz.* such as are made of metal, gold, silver, or copper, and struck according to a certain process, called coinage.

In the first ages each person cut his metal into pieces of different sizes and forms, according to the quantity to be given for any merchandise, or according to the demand of the seller, or the quantity stipulated between them. To this end they went to market laden with metal, in proportion to the purchase to be made, and furnished with instruments for portioning it, and with scales for dealing it out, according as occasion required. By degrees it was found more commodious to have pieces ready weighed; and as there were different weights required, according to the value of the different wares, all those of the same weight began to be distinguished with the same mark or figure; thus were coins carried one step farther. At length, the growing commerce of money beginning to be disturbed with frauds, both in the weights and matter, the public authority interposed; and hence the first stamps or impressions on money; to which succeeded the name of the money, and at length, the effigy of the prince, the date, legend, and other precautions, to prevent the alteration of the species; and thus were coins completed. The form, as well as the impressions upon them, varies in different countries. In Spain they have coins of an irregular figure. In some parts of the Indies they are *square;* and in others of a *globular* form. The shekel of the Jews was stamped, on one side, with the *golden pot* that held the manna; and on the other, with *Aaron's rod*. The Dardans stamped *two cocks* fighting. The Athenian coins were marked with an *owl* or an *ox*. Those of Ægina, with a *tortoise*. The Romans sometimes impressed theirs with the image of persons who had been eminent; but this compliment was never extended to the living, till after the fall of the commonwealth, when flattery induced them to stamp their coin on one side with the head of the *reigning emperor;* and since that time the custom has become universal among civilized nations, the Turks and other Mohammedans excepted, who, on account of their disapprobation of images, inscribe only the name of their prince, with the year of the emigration of Mohammed their prophet. MONEY, in the present advanced state of trade, is divided into real, or effective; and imaginary, or money of account. Real money includes all coins of gold, silver, and the like, which do really exist, as guineas, sovereigns, crowns, pistoles, pieces of eight, ducats, &c. Imaginary money is that which does not exist in real specie, but is a denomination invented to facilitate the stating of accounts; of which kind are pounds, marks, mitres, reals vellun, marravedies, &c. Guineas were first coined in king Charles II.'s reign, and had their name from the gold of which they were made, being brought from that part of Africa called Guinea. The first coinage of shillings was made by Henry VII., in 1503. Halfpence

and farthings were formerly struck in silver by Edward I., in 1280. The coinage of gold was not generally adopted by the states of Europe before the year 1320, when it was introduced into England by Edward III. The *sovereign*, a gold coin, value twenty shillings, issued a few years since, has superseded the guinea. When issued from the mint, a sovereign weighs five penny weights three grains.

CAXA, a small coin made of lead, mixed with some scoria of copper, struck in China, and some of the adjoining provinces, but current chiefly at Bantam, in the Island of Java, and neighbouring islands.

BILLS OF EXCHANGE are of great antiquity. Some are for carrying up their original to the days of Aristotle ; others, only to the flourishing times of the Roman empire ; and others assign to them a much later date. A bill of exchange may be defined, a written mandate of the drawer to his correspondent, ordering him to pay the creditor named in the bill the sum therein specified, at a certain time, and sometimes in a particular place, for causes mentioned in the bill itself.

USANCE is a customary time for the payment of foreign bills. In some places it is a calendar month ; that is, the time betwixt a certain day in one month, to the same day in the month following. Thus, from the 7th of Jan. to the 7th of Feb. is single usance, and from the 7th of Jan. to the 7th of March is double usance, and 15 days are half usance. But the word usance does not always import this space of time, but signifies sometimes more or less, according to the custom of the different nations or cities. Of the same nature are our *days of grace*, which are allowed for the payment of a bill after it becomes due. In the United Kingdom, 3 days are allowed ; in France and Dantzic, 10 ; Spain, 14 ; Portugal, Venice, Amsterdam, Rotterdam, and Antwerp, 6 ; Hamburgh, 12 ; Genoa, 30 ; Naples, 8 ; Frankfort, 4 ; Leipsic, 5 ; &c.

PAR of EXCHANGE is when he, to whom a bill is payable, receives of the acceptor just so much money in value, as was paid to the drawer by the remitter.

STERLING, a term frequent in English commerce ; a pound, a shilling, or penny *sterling*, signifies as much as a pound, shilling, or penny of *lawful money of England*, as settled by public authority. As to the origin of the word *sterling*, antiquaries are greatly divided. Some derive it from *striveling*, or *Sterling* in Scotland, where a small coin was anciently struck.—Camden derived the word from *easterling*, or esterling, because, in the reign of Richard I., money coined in the eastern part of Germany was valued in England for its purity, and was called *easterling* money, as all the inhabitants of those parts were called *Easterlings*. And in old deeds the English species are always called *nummi easterlingi*, which implies as much as good and lawful money. But Somner derives the word from *steore*, a rule or standard.

POLITY, or POLICY : the laws, orders, and regulations, prescribed for the government and conduct of states and communities. The word is used in opposition to barbarism ; and different states have different kinds of policy ; thus the policy of Athens differed from that of Sparta. Loyseau observes, that policy properly signifies the course and administration of justice in a city, which is now termed, after the French practice, *police*.

BROKER is a name given to persons of very different professions

Exchange Brokers are a kind of agents or negociators, who conclude bargains between merchants, tradesmen, &c., in matters of bills of exchange, or merchandise, for which they have a certain allowance under the name of *commission*. They make it their business to know the alteration of the course of exchange; to inform merchants how it goes, and give notice to those who have money to receive or pay beyond sea; and, when the bills are paid, they have the brokerage, 2*s.* for 100*l.* sterling. They carry with them a silver medal, having the king's arms, and the arms of the city. *Insurance Brokers* are those employed by ship-owners, or merchants shipping goods, to procure the signatures of *underwriters* to policies of insurance, on a ship or her cargo, against the dangers of the sea, or capture by the enemy. *Stock Brokers* are persons who buy and sell money for others in the public funds. These are very commonly confounded with *stock-jobbers*, though altogether different. The jobber is one who, having a small capital, endeavours to make a profit of it, by buying into the funds at a low price, and selling out at a higher. And this very commonly leads to a species of gambling, one agreeing to sell to another, on a certain future day, a given quantity of stock at a certain price. When that day comes, if the market price be higher than that agreed on, the seller gives the buyer the difference between the two; on the contrary, if it be lower, the buyer gives the seller the difference. From the well known fable of selling the bear's skin one of these is called a *bear;* the other, a *bull*. The term *broker*, upon common occasions in London, implies a man who buys and sells household furniture.

UNDERWRITERS are so called from the practice of writing their names at the bottom of insurance policies on ships, merchandize, &c., to a certain amount; by which they insure their safe arrival at the place of their destination, or indemnity to the amount specified, in case of failure. For thus insuring, they receive a premium of so much per cent. on the sums which they respectively insure; one underwriter insuring 1,000*l.* another 2,000*l.*, &c. on the same ship and cargo, according to their value.

A POLICY OF INSURANCE is an instrument granted by the insurers of goods or ships to the merchant or owner, obliging themselves to the payment of the sum insured in case of loss; and, as the insurance may either be on the ship or cargo, or both, and, again, either outward only, or both outward and inward, or to a certain port, &c.; so the form of the policy will somewhat vary accordingly.

A FACTOR is a correspondent or agent residing beyond seas, or in some remote part, commissioned by merchants, called his employers, to buy or sell goods on their account, or assist them in carrying on their trade. A factor's allowance, called also his commission, is commonly reckoned at so much per cent.; that is, so much on every hundred pounds' worth of goods he buys or sells; and is different in different countries. In Jamaica, Barbadoes, Virginia, and most of the plantations, it is often 8, and sometimes 10 per cent. In Aleppo, Smyrna, and other parts of Turkey, 3 per cent. In Leghorn and other parts of Italy, and in Britain, two and a half per cent. In Spain, Portugal, France, Holland, Hamburgh, and Dantzic, 2 per cent. And it is to be observed, that a factor has commission, not only on the price of goods bought and sold, but also on the charges paid by him.

CUSTOMS are the duties, dues, or tolls, paid by merchants to the king, for exporting and importing merchandise.

A CUSTOM-HOUSE is an office established in sea-port towns, for the management of the customs and dues of importation and exportation. These customs are regulated by a book of rates. If goods and merchandize are brought to a port, and part of the goods sold there, but never landed, they must pay the customs. Officers of the customs may search ships. If any person offer tea, brandy, &c., for sale, without a permit, the person to whom it is offered may seize and carry it to the next warehouse belonging to the customs, and be entitled to a third part of the produce.

SALE BY INCH OF CANDLE.—Merchants in London, particularly the East India Company, when they want to dispose of a cargo of goods speedily, commonly sell them by inch of candle, that is, they expose them to public sale, and the highest bidder is to have them. During the time of bidding for any lot, a small piece of wax candle, about an inch, is burning; and he who bids last, at the time the candle goes out, has the lot. Sale by *inch* of candle is not now, we believe, common; but sale by *candle*, where a small candle burns during the sale, is still practised.

LETTERS OF MARQUE are extraordinary commissions, granted to captains or merchants, for reprisals, in order to make a reparation for those damages they have sustained, or the goods they have been deprived of, by enemies at sea. These appear to be always joined to those of *reprise* for the reparation of a private injury, but under a declared war they are granted by way of reprisal for the general injury.

Military Affairs

Relate to the SOLDIERY, or persons appointed for the defence of the realm, &c. In free states, no man should take up arms, but with a view of defending his country and its laws. It was not till the reign of Henry VII., that the kings of England had a guard about their persons.

Military Discipline is the training of soldiers, and the due enforcement of the laws and regulations instituted by authority. This discipline is the soul of all armies; and unless it be established with prudence, and supported with resolution, they would be little better than a rabble, and more dangerous to a state than even its enemies. By the force of discipline men are kept in order and obedience to command, in opposition to the strongest impulse of their passions. When troops are said to be routed, nothing more is meant, but that they are put into confusion, or that *order* and *subordination* are fled.

Of RANK. The appointment of officers, and a regular gradation or chain of authority, are, in military affairs, necessary to proper discipline and subordination. One principle is, that there must be one supreme and sole in command. The officers, by whom an army is commanded, are the captain-general, or

COMMANDER IN CHIEF, and the other general and staff officers, as well as, sometimes, *Field-marshals;* see p. 280. A lieutenant, or even a major-general, has often, in our service, the appointment of commander in chief. A proper number of general officers are appointed, according to the strength of the army. For this pre-

portion no certain rules are established. When an army is considerable, the following is deemed an adequate staff, exclusive of the commander in chief: a general for the horse, and one for the foot, or general for each wing of the army; a major-general for every two brigades; and about half this number of lieutenant-generals. Notwithstanding the distinct appellation of *general*, *lieutenant-general*, and *major-general*, their duties are much the same. These terms serve little purpose but to denote the successive gradations of rank. *General officers* are those who not only command over a single company, or regiment, but whose office and authority extend over a body of several regiments of horse and foot.

GENERALISSIMO, called also captain-general, and simply the general, is an officer who commands all the military powers of a nation, who gives orders to all the general officers, and receives no orders himself but from the king.

FIELD MARSHAL is an officer of the highest permanent rank in the army. The number of officers of this rank in England is not numerous. The commander in chief is sometimes a field marshal, but not always so.

A MAJOR-GENERAL is a general officer, who receives the general's orders, and delivers them out to the majors of brigades, with whom he concerts what troops are to mount guard, what to form detachments, to go on parties, or be sent on convoys. It is his business, to view the ground to encamp on, and do various other services: he is subordinate to the general, and lieutenant-general, and the next commanding officer to them.

A BRIGADIER is the general officer who has the command of a *brigade*. The eldest colonels are generally advanced to this post. He that is upon duty, is brigadier of the day. They march at the head of their own brigades, and are allowed a sergeant and ten men of their own for their guard. The rank of brigadier-general in the British service is now abolished. Brigadiers, or sub-brigadiers, are posts in the horse guards.

COLONELS are commanders in chief of a regiment whether of horse or foot. A colonel may lay an officer of his regiment under arrest, but must acquaint the general with it. *A lieutenant-colonel* is the second officer in a regiment: he is above the major, and commands in the absence of the colonel. A lieutenant-colonel commands a regiment of guards, whereof, the king, prince, or some other person of eminence, is colonel. These lieutenant-colonels have always a colonel's commission, and are, usually, general officers.

A MAJOR of a regiment is an officer, whose business is, to convey all orders to the regiment, to draw it up and exercise it, to see it march in good order, to look to its quarters, and to rally it if it happen to be broken in an engagement. He is the lowest field officer, and in rank next above the captains. The major is the only officer of a regiment of foot, beside the colonel, who is allowed to be on horseback in time of service, but he rides, that he may have speedy communication from place to place, as occasion serves.

FIELD OFFICERS are every officer from a major of a regiment upwards; thus, majors, lieutenant colonels, colonels, brigadiers, generals of every kind, and field marshals, are field officers.

CAPTAINS.—There are several kinds of these military officers. A *captain-general* is he who commands in chief, and has been already

noticed. A captain of a troop or company is an officer next in rank to the major, who commands a troop of horse, or company of foot. The duty of this officer is, to be careful to keep his company full of able-bodied soldiers; to visit their tents or lodgings; to see what is wanting; to see that they keep themselves neat and clean, and their arms bright. He has power in his own company of making sergeants and corporals. In the horse and foot-guards the captains have the rank of colonels. A *captain-lieutenant* is he who, with the rank of captain, but with the pay of lieutenant, commands a troop or company in the name and place of some other person who is dispensed with, on account of his quality, from performing the functions of his post. Thus, the colonel being usually captain of the first company of his regiment, this company is commanded by his deputy, under the title of captain-lieutenant. The captain is to his company what the colonel is to the whole regiment. He has the entire charge and command of it, in every particular that regards its discipline and economy. A captain's usual command on guard, or detachment, is from 50 to 100 men, and he has always two subalterns along with him.

The commissioned officers, subordinate to the captain, are the LIEUTENANTS and ENSIGNS, who are commonly called the subaltern officers. These, though their rank is not the same, yet for the most part roll in duty together without distinction. Their ordinary duties are in garrison, guards, detachments, courts-martial, visiting the hospitals and barracks, fatigues or working parties, and orderly duties. No officer can exchange his duty with another, unless by permission of the commanding officer. The two junior ensigns bear the colours, and have the charge of them in battle. The ensign is under the lieutenant, and in his absence supplies his post.

CORNET is an officer that bears the colours of a troop of horse; he is similar in rank to the ensign of the infantry.

An ADJUTANT is an officer, whose business is to assist the major. Each battalion of foot and regiment of horse has an adjutant, who receives the orders every night from the brigade-major, which, after carrying them to the colonel, he delivers out to the serjeants. When detachments are to be made, he gives the number to be furnished by each company or troop, and assigns the hour and place of rendezvous. He also places the guards; receives and distributes the ammunition to the companies, &c.; and, by the major's orders, regulates the prices of bread, beer, and other provision. The word is sometimes used by the French for an aide-de-camp. An adjutant is to the commanding officer of a regiment what an aide-de-camp is to a general, and a major of a brigade to a brigadier. He likewise bears the same relation to a regiment as an adjutant-general does to an army.

QUARTER-MASTER is the next staff-officer to an adjutant. His employment is rather of a civil than a military nature, he having nothing to do with the discipline of a regiment. His care is in providing and inspecting their quarters.

The SURGEON is another commissioned officer on the staff of a regiment. He should not only be well skilled in every branch of surgery, but should also be a good physician and apothecary, being obliged to act in these three capacities toward the sick and wounded. He is allowed a mate to assist him, who has no commission, but acts by virtue of a warrant from the colonel. Before any person can be

appointed surgeon or mate to a regiment, he must pass an examination for each degree before the college of surgeons.

The CHAPLAIN is the last commissioned officer on the staff. His office is too well known to require an explanation. He is generally allowed to act by deputy, when he thinks proper.

The SERJEANT-MAJOR is the first, and properly speaking, the only non-commissioned officer on the staff. As the adjutant keeps the muster of the officers, so does the serjeant-major that of the sergeants and corporals, whom he warns for duty in their turns, and orders the quota of private men each company is to furnish. The serjeant-major attends all parades of the regiment, to see whether the exact number of men be there, and that they are clean and well dressed. He must be well acquainted with the exercise and manœuvres, in which it is frequently his business to instruct the young officers. He must also be well versed in regimental duty in general.

The *noncommissioned officers* are the *serjeants* and *corporals;* upon a proper choice of these officers the discipline of the company principally depends: for it is more immediately their business to form the soldiers; and, from their continual intercourse with them, they have it in their power to attend to matters which cannot so well come under the notice of others. A sergeant's command is from twelve to eighteen, with a corporal; and that of a corporal, from three to nine privates. No noncommissioned officer can change his duty without leave of the sergeant-major, or the adjutant, as well as the commanding officer of his company. When under arms, or drawn up in rank, the corporals are not to assume any command or give directions, but must attend to the word of command like the private men. They should be expert and graceful in handling their arms, as they are to serve as models to the young soldiers.

The DRUM-MAJOR has the command of all the drummers, and warns them in their turns for their different duties at roll-calling, and all their parades: he is to be answerable for the good appearance of the drummers, and is to report such as are absent without leave to the adjutant or serjeant-major. In action, the drum-major puts himself in the rear of the battalion, with all the drummers, except the orderly, to assist the wounded. All corporal punishments being inflicted by the drummers of the regiment, the drum-major is always to provide the proper instruments, and attend and oblige the drummers to do their duty.

Although the word SOLDIER, in a generic sense, applies to every military man, yet it is more commonly applicable to him who takes pay. The *vassal* is he who is obliged to serve at his own expense. The *volunteer*, he who serves at his own expense, and of his own accord. There is a provision for disabled soldiers: and when a soldier has served twenty years, he is entitled to be an out-pensioner of Chelsea Hospital, from which he receives about 18*l.* a year, and can set up his trade in any part of the kingdom. He may, if wounded and unable to get his living, be taken into the hospital and maintained for life.

The HORSE GUARDS are soldiers equipped and on horseback like dragoons; but they are usually finer and more select men; they are called *guards* from being more immediately attendant on the king. See CAVALRY. The horse guards have also better pay than dragoons.

The HORSE GUARDS also imply a place or building so called at Whitehall, London, where, in covered recesses, two horsemen or guards sit sentry for a certain number of hours every day; and where also the commander-in-chief of the army holds his levees, &c. &c.; the *Horse Guards* are the head-quarters of the military of the United Kingdom.

The FOOT GUARDS, or the GUARDS as they are sometimes called, for the same reason as the Horse Guards, from being attendant on the king and about the royal palaces, &c. have better pay than marching regiments. They usually remain in London about the palaces, the parks, &c. The officers of the foot-guards have better or more rank than officers of other regiments. An ensign of the guards ranks, or is upon an equality, with a lieutenant of a marching regiment; a lieutenant of the guards ranks as a captain; and a captain of the guards, as a lieutenant-colonel, and is called colonel.

DRAGOONS, (from *Dragen*, Germ. to carry,) are a class of soldiers who march on horseback: they fight both on foot and horseback. Dragoons are usually posted in the front of the camp, and march first to the charge. They are divided into brigades, as the cavalry, and each regiment into troops; each troop having a captain, lieutenant, cornet, quarter-master, two serjeants, three corporals, and two drums. Dragoons are very useful where despatch is requisite: for they keep pace with the cavalry, and do the duty of infantry. What are properly called dragoons, or heavy horse, are now disused in our armies; and those called Light dragoons, having smaller horses, and being lightly accoutred, are adopted in their place.

CAVALRY, a body of soldiers that charge on horseback, from the French *cavalerie*, and this from the corrupt Latin *caballus*, a horse. The Roman cavalry consisted wholly of those called *equites*, or knights, who were a distinct order of citizens. The chief use of cavalry is to make frequent excursions to disturb the enemy, and also ensure the retreat of the foot. There are two troops of horse-guards, or, as they are called *life-guards*, because they attend the king, and protect his person; there are also two troops of horse-grenadier guards; one regiment of horse-guards; seven regiments of dragoon guards, and twenty-five regiments of light dragoons.

SQUADRON, from the Italian *squardrone*, of the Latin *squadro*, used, by corruption, for *quadro*, because at first squadrons were always square. A squadron of horse is commonly from one to two hundred. It usually consists of three troops of fifty men each. It is always drawn up three deep, or in three ranks.

LIGHT HORSE includes all the horse except those of the life guards. The term is sometimes applied to an independent troop; or a troop not embodied into a regiment. The denomination arose hence, that, anciently, they were lightly armed in comparison of the royal guards.

FUSILEERS are foot soldiers armed with light firelocks. The word is formed from the French, *fusil*, a firelock.

GRENADIERS form one company of every regiment, and march at the head of that regiment: they are the tallest, and best-made men, picked out of the whole, and wear high caps on purpose to make them appear taller, in order to give the regiment a more noble appearance.

Every regiment of foot has also a company of Light Infantry,

who are picked men, next in size to the grenadiers. They are trained to manœuvre quickly, to advance with promptitude, and to cover the rear of the regiment in a retreat. When the regiment is drawn up in line, the grenadiers are on one flank, the light infantry on the other, whence they are called the *flank companies.*

JANISSARIES, an order of infantry in the Turkish armies, and reputed the Grand Seignior's foot guards.—Vigenere tells us, that the discipline observed among them is extremely conformable, in a great many things, to that used in the Roman legions.

HUSSARS, were a kind of soldiery in Poland, or Hungary, commonly opposed to the Ottoman cavalry. They were horsemen clothed in tiger and other skins, and set out with plumes of feathers; their arms are the sabre and bayonet. Most of the Europeans have now regiments called by this name.

ARTILLERY COMPANY, a band of infantry of 600 men, designed for the support of civil authority, and the defence of the metropolis. It consists of gentlemen of character and property; the officers are elected annually. They have a large field near Finsbury Square, where they exercise, known by the name of the *Artillery Ground.*

INFANTRY, is a body of *foot* soldiers of an indefinite number, and used always in contradistinction to cavalry.

TROOP, a small body of horse or dragoons, usually about fifty, commanded by a captain, answering to a company of foot.

A COMPANY denotes a body of infantry commanded by a captain. The number is uncertain, commonly fifty privates, three serjeants, three corporals, and two drums. In the guards, a company is eighty private men. What are called *independent companies* are not embodied into regiments.

BRIGADE, a party or division of a body of soldiers, either horse or foot, under the command of a brigadier. An army is divided into brigades of horse and brigades of foot; a brigade of horse is commonly a body of eight or ten squadrons; and a brigade of foot, of five or six battalions. A brigade of a troop of guards is a third part thereof; but, if the troop consists of 100, then only a sixth.

BATTALION, from *batualia, battalia,* or *battel,* implies a body of infantry, ranged in form of battle, and ready to engage. A battalion has from five to eight hundred men, of which one third were formerly armed with pikes, which are now laid aside; and the other two thirds, with muskets, posted on the wings. They are usually drawn up with three men in file, or one before another. Some regiments consist but of one battalion, others are divided into four or five.

MILITIA, in its restrained sense, signifies the inhabitants, or, as we call them, the trained bands of a town or country, who arm themselves on a short warning for their own defence. *Militia,* in this sense, is distinguished from regular forces. The militia are a distinct body of men, though they are disciplined like the army, and co-operate with them in time of war. Every county is obliged to raise a certain number out of the inhabitants of that county; and the men so raised are trained to arms, and, after serving seven years, others are drawn by lot to serve in their room. They are under arms only in time of war; when they are clothed and paid like other soldiers, and are under the same discipline: but, in time of peace, they are called out for one month, some time during the summer, and taught their exer-

cise, or the use of arms; and during the month only that they are so out, they are paid. The militia are ballotted for at the meetings appointed by the lord-lieutenant of the county. If any one, whose lot it is to serve, refuse serving, he must find a substitute, or pay a fine. The officers are usually appointed by the lord-lieutenant, out of the gentlemen of the county. Lieutenant-colonels must have an estate of 600*l.*; majors and captains, 200*l.*; lieutenants, 50*l.*; and ensigns, 20*l.* a year; one half of which property must be in the county for the militia of which they are chosen. Wounded militia men are, like other soldiers, entitled to the benefit of Chelsea Hospital, and have other privileges like them.

REGIMENT, a body consisting of several troops of horse, or companies of foot, commanded by a colonel. The number of men in a regiment is as undetermined as that of the men in a troop or company. A regiment of foot consists most commonly of from five to eight hundred or more men; of horse, from one to two hundred.

ARTILLERY, in its general sense, denotes the offensive apparatus of war, particularly of the missile kind. In its most appropriate acceptation it signifies fire arms, (exclusive of muskets, carbines, and pistols,) mounted on their carriages, and ready for action, with their balls, bombs, granedes, &c. If we take the term in its more extensive meaning, it includes the powder, matches, instruments for fireworks, the utensils of ordnance, the machines which facilitate their motion, the vehicles by which they cross rivers, every thing necessary to them, and all that enter into the form of a train of artillery. In fact, it is only within a few years, that the use of cannon in the field, or artillery, properly so called, has become so general as it is at present. The era of the French revolution may be considered that of its complete adoption; this was not a little aided by Dr. Anderson's invention of what he called flying artillery, which was submitted to, and rejected by, the English government during the American war: the ingenious inventor afterwards carried his plan to France, where it was instantly adopted. By *artillery* is likewise understood the science which the officers of artillery ought to possess: as the properties of gunpowder, the construction of warlike machines, and the management of the whole in the field.

ENGINEERS are a part of the artillery; their business is, to contrive attacks at sieges, and defend towns when besieged. They have the sole construction and disposition of all forts, redoubts, batteries, mines, &c.; the fortifying of camps and posts; reconnoitering the enemy's works; taking plans and surveys of a country; discovering the most advantageous methods for marching, retreating, attacking, or defending; building of all fortifications, magazines, and other military buildings: they ought, therefore, to be men of science, and particularly skilled in mathematics and military architecture.

CADET, a French word implying the younger son of a family; it has been lately applied, in this country, to a young gentleman who is in preparation for some employment, chiefly military.

OF THE NAVY.

The LORD HIGH ADMIRAL of ENGLAND is an officer of such great trust, that it has not been deemed expedient to appoint any subject to this station, the king being, nominally, lord high admiral

himself, while the duties of the office are executed by a commission, called the Board of Admiralty, consisting of five commissioners, denominated *lords of the admiralty*, one of whom, a resident, is called *first lord*. But latterly, the practice in this respect has been departed from, the Duke of Clarence having filled the office of lord high admiral in the years 1827 and 1828, assisted by a council. The board of admiralty takes cognizance of every thing transacted at sea, the management of all maritime affairs, direction of the Royal Navy, and both civil and criminal offences committed on the high seas. See page 335.

ADMIRAL is the next greatest officer in the navy. Though there is some doubt as to the origin of this officer, the most probable opinion is that of Sir Henry Spelman, who thinks, that both the name and dignity were derived from the Saracens, and by the holy wars brought among us: for admiral, in the Arabic language, signifies a prince or chief ruler. Du Cange says, that the Sicilians were the first, and the Genoese the next, who gave the denomination of admiral to the commanders of their naval armaments. Some think it was introduced among us in the reign of Edward I, or, according to others, of Henry III. Before the use of the word admiral was known, the title of *custos maris* was made use of. The admiral carries his flag at the main-topgallantmast head.

The VICE-ADMIRAL commands the second squadron, and carries his flag at the fore-topgallantmast head.

The REAR-ADMIRAL is the commander of the third squadron, and carries his flag at the mizen-topmast head. The ranks of these admirals are also distinguished by the colour of their flags: hence there are admirals, vice-admirals, and rear-admirals of the *red*, the *white*, and the *blue;* the red taking precedence, and the blue being the lowest, in each rank respectively.

COMMODORE is an occasional rank between an admiral and a captain. Its mark of distinction is a short, broad pendant. The senior captain of a squadron, who has the command when no admiral is present, or of a fleet of merchant ships, is also styled commodore.

CAPTAIN of a SHIP of WAR, the officer who commands a ship of the line of battle, or a frigate. The charge of a captain, in his majesty's navy, is very comprehensive, as he is not only answerable for any bad conduct in the military government and equipment of the ship he commands, but also, for any neglect of duty, or ill-management in his inferior officers, whose several charges he is appointed to superintend and regulate. He ranks with a colonel in the army.

Captain of a Ship, either of war, or a trading vessel, is the commanding officer. In a merchant ship, the officer to whom the direction is committed is properly called *master*, and in the Mediterranean the master is frequently called *patron*.

The MASTER of a ship of the line is properly the sailing captain, who takes cognizance of every thing respecting steering, keeping the ship's log, taking the sun's altitude, &c.

A LIEUTENANT in the navy is the officer next in command to the captain, and governs the ship in his absence. The number of lieutenants in a ship is always in proportion to her rate, a first rate having six, and a sixth rate only one. In engagements, the lieutenants superintend the manœuvres of the great guns, &c. The lieu-

tenant ranks with captains of horse and foot in the army. See Midshipman.

PILOT, from *proreta*, he who governs the prow or head; or from the old French *pile*, ship, as some suppose; a person who conducts a ship into a road, harbour, or through intricate channels.

A MIDSHIPMAN is appointed by the captain of a ship of war, to second the orders of the superior officers, and assist in the necessary business of the vessel, either aboard or ashore. A first rate man-of-war has twenty-four midshipmen; and the inferior rates, a suitable number in proportion. No person can be appointed lieutenant without having served two years in the royal navy in this capacity, or in that of mate, besides having been at least four years more in actual service at sea, in the royal navy.

A PURSER is an officer on board men-of-war, as well as in East Indiamen, who receives the victuals, and takes care that they are in good condition, and well laid up. He also keeps a list of the men and boys belonging to the ship, and sets down exactly the day of each man's admittance into pay, that the paymaster or treasurer of the navy may issue out his disbursements, and pay off the men, according to the purser's book. The slops and provision for the men's use are under his care, and provided by him where there is no establishment for the purpose. They are delivered out under his direction, by the

Steward; who is, in fact, the servant, or clerk, of the purser. For furnishing his majesty's navy with victuals, there was a victualling office on Tower-hill, managed by seven commissioners who have their inferior officers or secretaries, clerks, &c., beside agents in different parts of the kingdom. It is now removed to Deptford.

CLERK of a merchant ship is an officer appointed to take care that nothing be squandered needlessly; he is obliged to keep a journal and an inventory of every thing in the loading of the vessel; as the rigging, apparel, arms, provision, merchandises, the names of the passengers, the freight agreed on, a list of the crew, their age, wages, &c. The bargains, purchases, and sales, the ship makes from its departure; the consumption of provision, and, in short, every thing relating to the expense of the voyage. In small vessels the master does the office of clerk. In ships of war, the captain's clerk is appointed to keep the ship's accounts, write the captain's letters, &c.

CORPORAL of a ship, an officer who sees that the soldiers and sailors keep their arms neat and clean, and teaches them the use of arms. He has a mate under him. Corporals have the charge of setting the watch and sentries, and relieving them.

MARINES have strictly nothing to do in working the ship, their duty being merely to defend it in war, and attack the enemy when fighting: but, in fact, they commonly do the duty of ordinary seamen. They are trained and officered in the same manner as foot soldiers; and a certain number, with their proper officers, are put on board every ship of war, in proportion to its rate. There are one hundred and eighty-seven companies of them, four of which are artillery. In a sea-fight, their small arms are of very great advantage in scouring the decks of the enemy, when they have been long enough at sea to stand firm when a ship rocks: and they act occasionally as infantry on shore.

Of the *Lieutenant* and *Surgeon*, what has been said under a former

head will be sufficient.—*Mate* is the second in subordination, as the master's mate, surgeon's mate, &c.

CIVIL OFFICERS of the navy are, the TREASURER, who receives money out of the Exchequer, to pay all the charges of the navy. The CONTROLLER, who attends and controls all payments of wages, knows all the rates of stores, examines and audits all accounts. The SURVEYOR knows the state of all stores, sees all wants supplied, estimates, repairs, &c., and, at the end of each voyage, audits, and states all accounts. The CLERK OF THE ACTS records all orders, contracts, bills, warrants, &c. There are also several commissioners of the navy.

NAVY-BILLS, or victualling bills, are bills or orders for the payment of money issued by the commissioners of the navy, on the treasury of the navy, for stores purchased. They used to bear an interest at the rate of 4 1-2 per cent., after six months from the date of their being registered at the respective offices: and they have generally been paid off within eighteen months or two years from the time of their being issued.

The privileges conferred on sailors are much the same as on soldiers, with regard to relief, when maimed, wounded, or superannuated. Greenwich Hospital receives such seamen as are disabled from farther service, and provides for the widows and children of such as are killed. The hospital is supported by government, and by sixpence a month paid out of the wages of every seaman who serves in merchant ships. It has usually about 1000 *in* pensioners, and many more *out*.

SHIPS, VESSELS, &c.

A NAVY is the fleet or shipping of a prince or state. A *Fleet* implies a number of vessels going in company, whether on a design of war or commerce.

SHIP is a general name for all vessels with sails, fit for navigating the sea, except galleys, which go with oars and smack sails: but in its more strict signification, it means a square-rigged vessel with three distinct masts. The invention of ships is very ancient, but the time uncertain. Some look on Noah as the first ship-builder. Ships are usually divided into three classes: ships of war; merchant ships; and an intermediate kind, half war, half merchant; being such as, though built for merchandise, yet take commissions for war. Ships of war are again divided into several orders, according to their number of guns, called rates; besides sloops, gun-brigs, cutters, bomb-vessels, and fire-ships. A ship that carries a hundred guns or more is called a first rate, and her complement of men is from 850 to 875. Second rates carry from 90 to 98 guns, and from 700 to 750 men. Third rates, from 64 to 80 guns, and from 500 to 650 men. Fourth rates, from 50 to 60 guns, and from 320 to 420 men. Fifth rates, from 32 to 40 guns, and from 220 to 300 men. Sixth rates, from 20 to 28 guns, and from 140 to 200 men. These again rank in two classes, ships of the line and frigates. The former of these classes used to include the first four rates, but those of the fourth rate are now scarcely ever admitted into the line of battle. Ships with less than 20 guns, if neither fire-ships nor bomb-vessels, are styled sloops; and their superior officer is a *commander*, ranking between a captain and a lieutenant.

FRIGATE is a ship of war well built, and a good sailer; she has her guns usually on one deck; they vary in number from 28 to 60. Formerly the name of frigate was only known in the Mediterranean, where it was applied to a long vessel, navigated with sails and oars. The English are, it is said, the first who appeared in the ocean with those ships, and equipped them for war as well as commerce. Frigates, in the United States' navy, carry sometimes more than sixty guns.

A SLOOP, properly so called, is a vessel with one mast, and having her sails, the topsail excepted, set in the plane of her length. But *Sloops of War* have, nevertheless, usually three masts.

A CUTTER differs from a sloop in having her bowsprit horizontal, while that of the sloop rises a little upward; and in her mast raking aft or inclining towards the stern. Her hull too is formed more for fast sailing, and generally draws most water abaft.

A BRIG, or BRIGANTINE, is a square rigged vessel with two masts, having a boomb-mainsail like a sloop. Brigantine is properly the French term,

A SNOW differs from a brig in having a square mainsail; and a small mast, reaching up into the maintop, to which a tricesail mizen is attached.

A SCHOONER is a twomasted vessel, with fore and aft sails like a sloop, having a boom-sail to each mast.

Merchant-ships are estimated by their burden, that is, by the number of tons they carry, each ton reckoned 20 cwt. The estimate is made by gauging the hold, which is the proper place of loading. A vessel is said to draw ten or fifteen feet of water when it sinks so deep under water, being loaded. A vessel is said to be of three or four hundred tons burden when it will carry this weight.

YACHT, pronounced *Yot*, from the Dutch, *Iacht*, signifying hunting, a kind of vessel commodiously contrived and adorned to suit it to state passengers, &c. It is furnished with masts and sails, has one deck, carrying from 4 to 12 guns, with from 20 to 40 men; burden from 30 to 160 tons. It is used for running and making short trips. The Dutch yachts are chiefly used on their rivers and canals.

FIRE-SHIPS are filled with artificial fire-works, and sent in among the enemy's ships, to set them on fire.

BOMB-VESSELS have sometimes three masts and square sails, but also often ketch-fashion, with one mast and mizen.

A BOMB-KETCH is for the use of mortars at sea; it is a small vessel strengthened with large beams.

SMACKS are small vessels with but one mast, and sometimes are employed as tenders on a man-of-war; they are also used for fishing upon the coasts.

CARTEL, an agreement between two states for the exchange of their prisoners of war. A cartel-ship is one commissioned in time of war to exchange the prisoners of any two hostile powers, &c. She must carry no cargo, ammunition, or implements of war, except a single gun for firing signals.

A GALLEY is a low-built vessel, going with oars and sails, chiefly used by the states bordering on the Mediterranean. Galleys have usually twenty-five or thirty benches of oars on each side, and four or five galley slaves on each bench. The galley carries a large gun, two bastard pieces, and two small ones. It is usually from twenty

to twenty-two fathoms long, three broad, and one deep, and has two masts, *viz.* a main-mast, and a fore-mast, which may be struck or lowered at pleasure.

CONVOY signifies one or more vessels of war, appointed to conduct a fleet of merchants' ships, serving as a watch and shelter from the insults of enemies. It also implies the fleet of merchant ships bound to any particular part, or place of rendezvous, under the protection of a convoy.

SQUADRON of ships, a division or part of a fleet commanded by a commodore, or a rear or vice admiral. The number that forms a squadron is not fixed. A small number in a body, and under one commander, may make a squadron. If the ships are numerous, they are sometimes divided into three squadrons, and each squadron may be again divided into three divisions.

PRIVATEERS are private ships of war, fitted out by private persons at their own expense, who have leave granted them to keep what they can take from the enemy.

BARGE, a kind of state or pleasure boat, or for the purpose of merchandise, used chiefly in the navigation of rivers. Barges have various names according to their particular uses; as a company's barge; a royal barge; a Severn trow; a Ware barge; a West-country barge.

CANOE, a vessel or boat used among the Indians, made of the trunk of a tree, hollowed, or several pieces of the bark put together. The small canoes are very narrow, have room for one person only in breadth, and seven or eight lengthwise. They are rowed with paddles, formed and managed very differently from oars. The rowers, who are generally savages, are very expert in managing and balancing their canoes. When they come near a water-fall, or when they want to cross over land from one river to another, they carry their canoes on their heads. The inhabitants of Greenland, Otaheite, Hudson's Bay, &c., have canoes larger and very different from the above.

CORACLE, a very small boat about four feet long and three feet wide, made of split rods and covered with tared cloth so as to keep out the water. It will only hold conveniently one person who sits on a seat which is fixed across it; the half of a walnut-shell will convey some idea of this canoe which is used very commonly in the river Wye, the Towy, &c. It is so light that the fisherman carries it at his back; it is directed by a small paddle.

Fire Arms and Implements of War.

ORDNANCE, a general term for all sorts of great guns or cannons, mortars, &c. used in war. Ordnance in England is distinguished into two kinds, *viz.* field pieces, which are from the smallest to twelve pounders, and battering guns, which are from twelve to twenty-four pounders.

The ORDNANCE OFFICE is the standing grand magazine of arms and instruments of war, used as well by sea as land, not only for those in the Tower, but in all the garrisons and forts in Great Britain. The officers of the ordnance are the master-general, and under him a lieutenant-general, and next, the surveyor-general, and under him the clerk of the ordnance, with some others.

CANNON, in war, is a military engine, or large gun, for throwing iron, lead, or stone bullets, by force of gunpowder. The word seems derived from the Italian *cannone*, an augmentation of *canna*, cane; because a cannon is long, straight, and hollow, like a cane. The first cannons were called *bombarda*, from *bombus*, on account of their noise. Larray makes brass cannon the invention of J. Owen, and says, the first known in England were in 1535. Cannons, however, he owns, were known before; and observes, that at the battle of Cressy, in 1346, there were five pieces of cannon in the English army, which were the first that had been seen in France.—Mezeray adds, that king Edward struck terror into the French army by five or six pieces of cannon, it being the first time they had seen such thundering machines. Cannons are made cylindrical, that the motion of the ball might not be retarded in its passage; and that the powder, when on fire, might not slip between the ball and the surface of the cannon, which would hinder its effect. The new cannons, after the Spanish manner, have a cavity or chamber at the bottom of the barrel, which helps their effects. Cannons are distinguished by the weight of the balls they carry, but this distinction varies in different nations. The proportion of their length to their diameter depends rather on experience, than any reasoning *a priori*, and has been accordingly various, in various times and places.—Formerly cannons were made much longer than at present; till some, made by chance two feet and a half shorter than ordinary, taught men, that the ball moves with a greater impetuosity through a less space than a larger. This Gustavus, king of Sweden, proved by experience in 1524; when an iron ball, forty-eight pounds weight, was found to go farther from a new short cannon, than another ball of ninety-six pounds out of an old, longer piece; whereas, in other respects, it is certain the larger the bore and ball, the greater the range. The metal of cannon is either iron, or a mixture of copper, tin, and brass: the tin is added to the copper to make the metal more hard and durable. The ordinary charge of a cannon is for the weight of its gunpowder half that of its ball. After each thirty discharges, the cannon is to be cooled, with two pints of vinegar, mixed with four of water, poured into the barrel, the touch hole being first stopped.

MORTAR, a short piece of ordnance, thick and wide, proper for throwing bombs, carcasses, shells, stones, &c. There are two kinds of mortars; the one hung or mounted on a carriage with low wheels, after the manner of guns, called pendant or hanging mortars: the other, fixed on an immoveable base, called standing mortars. At the head of the bore, or chase of the mortar, is the chamber, for the charge of powder. This is usually made cylindrical, all but the base, which is made hemispherical, though some of the later engineers prefer spherical chambers; as the surface of these, being less under equal capacities, make less resistance to the gunpowder. The thickness of the mortar about the chamber is to be much greater than about the chase, as the gunpowder makes a much greater effort about the chamber than elsewhere. The diameter of the chamber is much less than that of the bore; as bombs, shells, &c., are much lighter than bullets of equal diameters; and consequently less powder suffices.

To charge a mortar: the proper quantity of gunpowder is put into the chamber, and if there be any vacant space, it is filled up with

hay, or with a wooden plug. Near this is laid a turf, or a wooden tampion fitted to the bore of the piece, and lastly, the bomb, taking care that the fusee be in the axis thereof, and the orifice turned from the muzzle of the piece. What remains, is to be filled up with hay, straw, turf, &c. so as the load may not be exploded without the utmost violence. The quantity of gunpowder to be used is found by dividing the weight of the bomb by thirty; though this rule is not always to be strictly observed.

MUSKET, a fire-arm borne on the shoulder, and used in war. The length of the musket is fixed to three feet eight inches from the muzzle to the touch-pan, and its bore is such as may receive a ball of sixteen to the pound.

PERCUSSION-GUN. In this ingenious missile instrument a small quantity of detonating powder is employed as a substitute for the ordinary priming of gunpowder. A hammer being loosened by the trigger, falls on the inflammable material, and ignites it by the percussion which results. The principal value of fire-arms thus constructed arises from the facility with which they may be discharged in damp and rainy weather.

A HALBERT is a weapon consisting of a shaft or staff, five feet long, with a pike head, below which is a cross piece of steel, forming a very broad hatchet on one side, and terminating in a point on the other. This was anciently a common weapon in the army, and was till lately carried by the sergeants of foot, though pikes are now substituted. It was called the Danish axe, because first borne by the Danes; from the Danes, it passed to the Scots, thence to the English, and afterwards, to the French.

A BAYONET is of great use to the dragoons and fusileers, after they have spent their powder and ball. It is a kind of triangular dagger, made to fix on the end of the musket, and is so well known as to need no description.

CARABINE, a fire-arm shorter than a musket, carrying a ball of twenty-four to the pound, borne by the light horse, hanging at the belt over the right shoulder. The barrel is two feet and a half long, and is sometimes furrowed spirally within, or rifled, which is said to add to the range of the piece. *Caribiniers* are regiments of light horse carrying longer carabines than the rest. Sometimes they are used on foot.

PISTOL is said to have taken its name from *Pistoya*, a city in Italy, where it was first made. This small fire-arm, which is well known, is sometimes carried at the saddle bow, or in the pocket.

PONIARD, a kind of dagger or short sword.

BOMB, from *bombus*, a hollow iron ball or shell, thrown out of a mortar. Bombs are of different magnitudes. One of seventeen inches in diameter will contain about forty-eight pounds of gunpowder, and will weigh 400 lbs. The thickness of the metal may be one tenth, or more, of the whole diameter. In a bomb, there is an aperture or vent for a fusee, or wooden tube filled with combustible matter.

GRENADE or GRENADO, a hollow ball filled with grains of powder. The composition of grenades is the same as that of bombs, only they are less, and cast with the hand. They usually weigh about three pounds, and are about the size of an iron bullet. The

common or hand grenades are either, of iron, tin, wood, paste-board, &c. They are filled with strong gunpowder, and lighted with a fusee.

A BULLET is an iron or leaden ball, with which fire-arms are loaded. There are several kinds; chain bullets consist of two balls, joined by a chain three or four feet long. Two-headed bullets, called *angels*, are two halves of a bullet, joined by a bar or chain, chiefly used for cutting cords, cables, sails, &c.; called also chain shot. Branch bullets are two balls, joined by a bar of iron, five or six inches apart. Hollow bullets are shells made cylindrical, with a fusee at one end. Redhot bullets are made so by being heated in a forge, in order to set fire to places where combustible matters are found. Bullets are cast in iron moulds, consisting of two concave hemispheres, with a handle whereby to hold them; and between them is a hole called the gate, at which to pour in the melted metal.

SHOT, in the military art, includes all sorts of balls or bullets for fire-arms, from the cannon to the pistol. Those for cannon are generally of iron; those for muskets, carabines, and pistols, of lead. Shot for fowling is called small-shot. The method of casting it is as follows:—The lead being melted, stirred, and skimmed, a quantity of powdered yellow orpiment is strewed on it; as much as will lie on a shilling to twelve or fifteen pounds of lead. The whole being well stirred, the orpiment will inflame. This done, a copper plate, hollow in the middle, and three inches in diameter, bored through with thirty or forty small holes, according to the size of the shot, is placed on an iron frame over a tub of water: the hollow part is to be very thin. On this plate are laid burning coals, to keep the melted lead in fusion. The lead is now poured gently with the ladle, on the middle of the plate, and it will make its way through the bottom of the plate into the water, in round drops. Great care is taken to keep the lead on the plate in its proper degree of heat; if too cold, it will stop the holes, and if too hot, the drops will crack and fly. The shots, thus made, are dried over a gentle fire, always stirring them that they do not melt; when dry, the greater are separated from the smaller, by passing them through sieves for this purpose.

GUNPOWDER, it is said, was discovered by a chemist, who having put some of the composition into a mortar, and covered it with a stone, it happened to take fire and blow up. But when it was really first invented, or by whom, seems to be still a matter of uncertainty. Roger Bacon, it is clear, knew of it, from a treatise of his published in 1216. "You may," says he, "raise thunder and lightning at pleasure, by only taking *sulphur*, *nitre*, and *charcoal*, which, singly, have no effect, but mixed together, and confined, cause a noise and explosion greater than thunder." The goodness of gunpowder depends on the proportions of the three ingredients. They are, however, varied for different purposes; common gunpowder usually consists of 75 parts of saltpetre, 12.5 of charcoal, and 12.5 of sulphur. When these are determined, each must be reduced to a powder, and mixed in a mortar with water, and then pounded till the whole becomes a uniform and smooth mass. It must be wetted frequently, or it will take fire. It must be then pressed through a sieve, by which it becomes formed into small grains; and when dry, the powder is complete. The violence of the explosion of gunpowder depends upon the sudden production of gaseous matter resulting from the action of

the combustibles upon the nitre. Carbonic oxide, carbonic acid, nitrogen, and sulphurous acid are the principal gaseous results, and the solid residue consists of sub-carbonate, sulphate, and sulphuret of potassa, and charcoal. There are several kinds of gunpowder, as cannon, musket, and pistol powder, which differ only in the size of the grains in which they are made. White powder is made with *sawdust of elder, &c.*, instead of charcoal.

BOW.—The bow is one of the most ancient and most universal of all weapons. The Laplanders, who support themselves almost entirely by hunting, have an art of making bows, at which we, in these improved parts of the world, have never arrived. Their bow is made of two pieces of tough and strong wood, shaved down to the same size, and then flatted on each side: the two flat sides of the pieces are brought closely and evenly together, and then joined by means of a glue superior in strength to any which we have. The two pieces, united in this manner, will never separate; and the bow is of much more force to expel the arrow, than it could possibly have been, under the same dimensions, if made of only one piece. Among the ancients, the bow-string was made of horse's hair; though Homer's bow-strings are frequently made of hides, cut into small thongs. The ancient bows were composed of wood, and some of horn, as appears from Homer. The Indians still retain the bow. The Scythian bows were distinguished from those of other nations by their incurvation being so great as to form a half moon, or semi-circle.

The CROSS-BOW, called also *arbalist*, consists of a steel bow, set in a shaft of wood, furnished with a string and trigger. It serves to throw bullets, large arrows, darts, &c. The ancients had machines for throwing many arrows at once.

ARCHERY, the art of shooting with a bow and arrow. In most nations, the bow was anciently the principal implement of war; and by the expertness of the archers alone was often decided the fate of battles and empires. In this island, archery was greatly encouraged in former times; and the English archers became the best in Europe, and obtained many signal victories. The Artillery-Company of London is the remains of the ancient fraternity of bow-men, or archers. Artillery (*artillerie*) is a French term signifying *archery*. William the Conqueror had a considerable number of *bow-men* at the battle of Hastings. The long-bow maintained its place in our armies long after the invention of fire-arms; and it still continues to be used as a manly exercise in Great Britain. There are several societies of archers in England, as the *Woodmen of Arden*, the *Toxophilite*, &c.; and the Royal Company of Archers in Scotland. In former times, great victories have been gained without the least assistance from the men-at-arms; particularly, the decisive victory over the Scots at Homildon, 1402. In that bloody battle the men-at-arms did not strike a stroke, but were mere spectators of the valour and victory of the archers. Edward III. issued an order to the sheriffs for providing 500 white bows, and 500 bundles of arrows, for his intended war against France. Similar orders were repeated in the following years; with this difference only, that the Sheriff of Gloucestershire was directed to furnish 500 painted bows, as well as the same number of white. The famous battle of Cressy was fought four years after, in which, our chronologers state, we had 2,000 archers. The regula-

tion of the Irish statute of Edward IV., that the bow should not exceed the height of a man, is allowed by archers to have been well considered; and the arrow should be half the length of the bow. Arrows were reckoned by sheaves, a sheaf consisting of twenty-four arrows. They were carried in a *quiver*, called also an arrow case.

END OF THE THIRD PART.

PART IV.

Arts, Sciences, Literature, Religion, etc.

ART is a disposal of natural objects by human thought and experience so as to answer the various purposes of mankind, whether those purposes be of great or of little importance, or even mere amusement. Thus, we have the *art* of the *weaver*, of the *turner*, of the *carpenter*, of the *mason*, of *pyrotechny*, &c. &c.

The ARTS are usually divided into *useful* or *mechanical*, and the *polite* or *liberal*. The *useful* are such as we have above enumerated; the *polite* are those of *poetry, painting, sculpture, music*, &c. &c.

SCIENCE is KNOWLEDGE reduced to a system, so as to be conveniently taught, easily remembered, and readily applied. From this simple, yet comprehensive definition, it is evident that the *knowledge* of many arts reduced to rules becomes a *science*. Thus, the *art of building* is taught by the *science* of *architecture;* the *art* of *assaying metals* by the *science of chemistry;* the *art* of *curing diseases* by the *science of medicine*, &c. &c. See page 21.

In fact, however, such is the nature of language and its use among mankind, that the terms *art* and *science* are sometimes used indiscriminately for the same thing; and it is to be feared, that no efforts of the philologer or philosopher in the use of terms can prevent the constant recurrence of such anomalies in living language as well as in our books. The study of

LANGUAGE, therefore, and a knowledge of the correct meaning of terms, are of infinite importance even in the every day transactions of life; and in order to the correct expression of our thoughts, both orally and in writing, a thorough acquaintance with the meaning of words in our own language, at any rate, is indispensably necessary: some observations on this subject will be found in pages 24 and 25, to which the student will be kind enough to refer. But besides what is there said, we think it necessary also to observe, that a correct knowledge of language can scarcely be acquired without a knowledge of the real nature and structure of language itself. This knowledge has been commonly called

GRAMMAR, and should be acquired by every one having the least pretensions to education. But although we recommend a knowledge of grammar as essential in a course of education, we are far from recommending it because some of those who have written upon it have made it a wearisome pursuit rather than an agreeable study; but because we are well assured that a knowledge of grammar may be conveyed in a much more agreeable way than it usually is,

and also that when so conveyed, by one who has just notions concerning the structure of language, grammar, so far from being a dry study, may be made the very reverse. To this end it is, however, necessary that *the teacher should himself be well acquainted with the structure of language*, and that all his instructions in grammar should be *viva voce*, and not through the medium of books. This is not the place to sketch the mode of teaching grammar which we recommend; but we may state thus much, that persons, whether children or adults, unacquainted with the structure of language and the terms of grammar, should be taught *in classes*.

Thus, appropriate *sentences*, having, first, the *articles* conspicuous in them, should be chosen for exemplification; the use and meaning of the articles in the sentence should be pointed out, and then, and *not before*, the names given to them; from the articles we should proceed to the *prepositions*, and treat them in the same way, then the *substantives*, then the *adjectives*, then the *adverbs*, then the *verbs*, and so on; taking care to point out, as we go along, the different offices which these different words perform in a sentence, and impressing upon the minds of the students by *oral* instruction, with a printed sentence before the class on which to comment and explain, such knowledge concerning the structure of language—the grammar of it, apart from much of what is mere technicality,—which it is essential they should know. Till grammar is taught in some such way as this, it will continue a disgusting study, and few persons, comparatively, will ever know much about it.

Next to a knowledge of language and grammar, perhaps, as teaching us the best method of obtaining shelter from the weather, and comfort in our domestic circles,

Architecture

Demands an early notice. It is scarcely necessary to say that architecture is the art or science of building; the excellence of which consists in such a disposition of the materials employed in an edifice as shall give it strength, convenience, beauty and proportion. When architecture assumed the dignity of a science it is difficult, if not impossible, to say. That it was, in the early ages of the world, an improving and progressive art,—from the rude hut of the savage to the finished palace of a king,—there can be no doubt. A city, we are informed, was built by Enoch, but of what materials, or in what manner they were put together, is unknown. After the Flood, the builders of Babel used brick, and slime instead of mortar.

One of the most striking characteristics of the buildings of the ancients is their size. Besides the Tower of Babel, of which we are told by an old author, and whose foundations were to be seen in his time, who has not heard of the Walls of Babylon, its hanging gardens, and its temple of Jupiter Belus, which, it is said, rose a mile high, by eight several stories, each of which was a furlong in height, and on the top was the Babylonian observatory? We might also name the huge rock cut into the figure of Semiramis, with smaller rocks that lay by it in the shape of tributary kings; the prodigious bason or artificial lake, which took in the whole Euphrates, until the new canal that was formed for its reception may also be mentioned; although, by some persons, these wonders of art are esteemed fabulous,

yet enough of the architecture of remote antiquity remains to assure us that many of its structures were of immense magnitude, of which the *Pyramids* and other buildings in Egypt are striking monuments. The great pyramid is said to stand on eleven acres of ground, and to be in height four hundred and forty-eight feet; that is, more than one hundred feet higher than the cathedral of St. Paul's in London.

Although there can be no doubt that the Persians and Egyptians preceded the Greeks in their knowledge of architecture, yet the Greeks materially improved upon the models presented to them. It is said, indeed, that the Greeks invented the *Doric*, the *Ionic* and *Corinthian* orders, as the names would imply; but an examination of the ruins of Shushan, of Persepolis, or Tchilminar, will shew the first models of every thing that distinguishes Grecian architecture.

The most striking characteristics of architecture are the *columns*, or those pillars which are erected either as supports or ornaments to a building. They are commonly constructed of marble or other stone; and consist, in their complete state, of the ENTABLATURE, being all the ornaments above the capital, as *architrave, frieze, cornice;* of the CAPITAL;—of the SHAFT; and of the PEDESTAL.

The CAPITAL consists, in the *Corinthian* order, of various engraved leaves, with small volutes; the capital of the *Composite* order has leaves as the Corinthian, but is surmounted by large scrolls or volutes similar to that by which the Ionic order is distinguished.

The SHAFT is the straight and chief part of the column, fluted or plain, as the case may be.

The PEDESTAL is the lower part of the column, on which all the upper parts rest.

The ORDERS of Architecture are five, *viz.* the *Tuscan*, the *Doric*, the *Ionic*, the *Corinthian*, and the *Composite*.

The *Tuscan order* had its origin and name from Tuscany, an Italian state; having strong and massive proportions, it is usually employed in buildings where ornaments are not required, but where strength is the principal object.

The *Doric order* derives its name from the Dorians, a people who inhabited one of the Grecian districts called *Doris;* it is considered grave, robust, and masculine; hence it has been termed the Herculean order. It is distinguished by having on the freize a *triglyph;* this ornament is, however, sometimes omitted. The ancients employed this order in temples dedicated to Juno, Minerva, Mars, and Hercules.

The *Ionic order* originated with the people of Ionia, another district of Greece. The Ionic column is more slender and graceful than the Doric, being in composition between the richness of the Corinthian and the plainness of the Tuscan order. The *volute* or scroll in the capital is the distinguishing characteristic of the Ionic order.

The *Corinthian order* had its origin at Corinth, a city of Greece. It is usually considered the finest of all the architectural orders, and a memorial of the exquisite taste and genius of Greece. The most perfect model of this order is considered in the three columns in the Campo Vaccino at Rome, the remains, it is supposed, of the temple of Jupiter Stator. The capital of this order will be best seen in the engraving below.

The *Composite order* had its origin among the ancient Romans; Serlio is said to have been its inventor. It partakes of the Ionic and

Corinthian orders, but mostly of the latter, particularly in the leaves of its capital.

ORDERS.

Tuscan. *Doric.* *Ionic.* *Corinthian.* *Composite.*

PILASTERS differ from columns only in their form, which is square, that of columns being round. Their bases, capitals, and entablatures, have the same parts as columns; they are also distinguished in the same manner by the names of Tuscan, Doric, Ionic, Corinthian and Composite. The column is, no doubt, more perfect than the pilaster; yet pilasters are employed on some occasions to save room, with great advantage.

Before quitting the column, we may just observe, that all architectural columns diminish in diameter of the shaft as they ascend. Architects have certain rules for such diminutions which it is not necessary here to describe; we may, however, mention that, most probably, the origin of such diminutions arose in the earlier ages of the world when *trees* were occasionally used for *columns;* hence the architectural column is, in all probability, an imitation of a tree.

Besides these elegant or Grecian orders of buildings, several others are known in Europe, of which a brief notice shall be given; they have been all distinguished by the term

Gothic Architecture, although they may be, perhaps with more pro-

priety, divided into *Saxon*, *Norman*, and *Saracenic*. *Saxon* architecture is the Roman architecture in a decayed state; its characteristics are the semi-circular arch, and short thick massive columns. It has neither pinnacles nor pointed ornaments, nor any statues except in relief. The north transept of Winchester Cathedral is considered a very good specimen of this style.

Norman Architecture differs from Saxon chiefly in its increased proportions, and the magnitude and massiveness of its buildings. The arches were highly ornamented with various figures; the capitals were adorned with carvings of foliage and animals; and the columns had small half ones joined to them, the surfaces being variously ornamented. This style is seen in the monastary in Lindesfern in Holy Island, Durham Cathedral, and in the crypt of Canterbury Cathedral.

Saracenic, or *Gothic* Architecture, more particularly so called, consists in numerous and prominent buttresses, lofty spires, and pinnacles, large and ramified windows, ornamented niches, sculptured saints and angels, fretted roofs, and profusion of ornaments; but its most distinguishing characteristics are small clustered pillars and pointed arches. It is supposed to be of Arabic origin, and to have been introduced by the crusaders. Salisbury Cathedral is a fine specimen of this style.

The *Florid Gothic* is still more elaborate with ornaments; Edward I. caused several crosses to be erected in memory of his queen, which were profusely decorated with sculpture; most of these crosses have been destroyed; those at Northampton, Geddington, and Waltham are the most perfect which now remain.

Among the principal erections in the *Gothic* style may be reckoned the nave and western part of York Cathedral, the whole of Lichfield Cathedral, a transept of Canterbury Cathedral; Merton and New College, Oxford, St. Stephen's Chapel and Henry VIIth's Chapel, at Westminster.

From the time of Henry VIII. Gothic architecture began to decline. In the sixteenth and seventeenth centuries the chaste architecture of the Greeks and Romans was revived; and the Italians were, for a time, considered the first architects: but England has produced men who have successfully rivalled them. Sir Christopher Wren's name is alone a host. There is still, however, a disposition to perpetuate *Gothic* architecture in the erection, lately, of many new churches in this style, for which, from association, or some other cause, it seems peculiarly adapted. The present time has also added considerably to the architectural taste and embellishment of the metropolis; to name our living architects would be invidious; but *Regent Street*, in the metropolis, will itself ever be a monument of the improved taste and state of the architecture of the age.

Next to the knowledge of architecture, one of the most useful kinds of knowledge is that of

AGRICULTURE, by which is usually understood the art of cultivating the earth so that it may produce the vegetables which we want in the greatest quantity and perfection.

Although, apparently, a very simple art, agriculture is always the effect of some thought and forecast. In the rude states of society, as far as we have had an opportunity of examining mankind, agriculture is little, if at all, practised; it is not till man becomes fixed to

one spot, to have *a home*, that he is tempted to cultivate the soil in order to obtain that support from vegetables which in a savage state he usually obtains, at least in the temperate regions of the globe, from animated nature.

In this country, previously to the invasion of the Romans, agriculture was very little known; soon after their arrival, it is said that the culture of the soil was so much attended to that the people were enabled to export large quantities of grain from this island.

In what ever light we view agriculture, whether as the means of procuring not only the necessaries, comforts, and luxuries of life, or as a security against the calamities of scarcity and famine, or as interesting the mind and body in a most useful pursuit, as a relief, by moderate labour, from the most unfortunate of all conditions in the world, that of having nothing to do, we shall not fail to arrive at the conclusion, that the knowledge and practice of agriculture are some of the best means for the furtherance of human happiness, with which we are acquainted. But, in order to make the most of agriculture, it is necessary that he who pursues it, whether as a pleasure or as a business, should bring to his aid a variety of other useful knowledge now happily open to us, and of which every one having a very ordinary portion of leisure ought not to be ignorant.

For, although so much knowledge of the subject is abroad, yet from the differences of climate, of seasons, and of soils, the most expert agriculturist will constantly find something occurring upon which he did not calculate, something upon which he may improve; and therefore, as assistants in improvement, a knowledge of the natural history of plants of various kinds, of chemistry, experimental philosophy, and of mechanics may be all successively and successfully applied to its advancement. It is this particular knowledge that must and ever will distinguish the *scientific* from the ignorant agriculturist; and which will confer that superiority upon the former which the latter never can possess, and is evinced in the *trite aphorism* of Bacon, "*Knowledge is Power.*"

Convinced as we are that agriculture, combined with science, is at once the most valuable, interesting, and pleasing of pursuits, whether it be that of tilling the ground, tending the young plants and reaping the produce; whether it be another branch of it, that of *horticulture* and the production of *fruits*, or another yet perhaps more pleasing, that of the *cultivation of flowers;* we strongly recommend these pursuits and the studies connected with them to our young friends, being well assured that they will thus be furnished with abundant means of increasing the sum total of pleasurable enjoyment—as well of their own, as of their fellows' happiness.

Next to Agriculture in utility is a knowledge of

NATURAL HISTORY, which may be defined that science which describes the nature and properties of all the natural bodies found in the animal, vegetable, and mineral kingdoms, as well as air, water, meteors, &c. As more immediately connected with agriculture we shall first treat of

BOTANY, or the science of vegetation; consisting of a knowledge of plants, their several kinds, countries, forms, uses and virtues.

Botany is unquestionably a very pleasing, as well as a very useful study. For ages it however consisted of a rude aggregation of facts without order or connexion, and although much was done by PLINY among the ancients, and RAY and others among the moderns, till the

time of LINNÆUS, who may be considered the father of modern botanists, the science was in a very chaotic state.

It will not be consistent with the brevity of this epitome to enter into much detail of the Linnean system, but we may observe, it is founded on the fact that there is in vegetables, as well as in animals, a real distinction of the sexes; that each plant may be analyzed by its several organs of fructification. Hence, as all vegetables produce blossoms, fruit, or seed, the parts which compose the flower must be minutely examined in every plant. These consist of the *calyx*, flower-cup, or empalement; the *corolla*, blossom, flower leaf, or leaves; the *stamina*, or chives; the *pistillum*, or pointal; the *pericarpium*, or seed-vessel; the *semina*, or seeds; to these may be added the *nectary*, or honey-cup; and the *receptacle*.

It should be also observed that in some plants the *male* and *female* organs are in the same flower; such are the *pear* and *apple*, the *white* thorn, the *plum;* and innumerable garden flowers. In others the male and female flowers are distinct, yet on the same plant, as in the *cucumber* and *gourd* tribe: and again in others, yet more rarely, on different plants, as in the flowers called *stocks*, *hemp*, *&c.*

LINNÆUS divided the vegetable world into twenty-four classes; these again into *orders;* the orders again into *genera;* and these again into *species;* and many of these again into *varieties*.

The CLASSES refer to the number of STAMENS, or *male* parts of the flower, as far as class 13, inclusively; and afterwards to their *position*. The ORDERS are denominated from the number of PISTILS, or *female* parts, as far as class 13, inclusively; and afterwards from some other circumstances, such as *gymnospermic*, or with naked seeds; *angiospermic*, or with seeds in a pericarp; *siliculous*, or with seeds in a pod, &c. &c.

Linnæus calls those plants which have the sexual organs in the same flower *hermaphrodites*, of which eighteen classes out of the twenty-four consist. The remaining six classes have other characteristics. The 21st class consists of plants having *distinct* male and female flowers. Such are the *bread fruit tree*, the *indian corn*, the *amaranth*, the *cocoa-tree*, the *oak*, the *walnut*, the *beech*, the *pine*, &c. The 22d class has male and female flowers on *distinct* plants, such are the *screw pine*, the *willow*, the *berry-bearing heath*, the *hemp*, the *hop*, the *poplar*, the *juniper*, the *yew*, &c. The 23d class consists of plants bearing hermaphrodite flowers, and also either male or female flowers, or both; the *plantain-tree*, the *maple*, the *sensitive plant*, the *ash*, the *fig*, &c. are examples of this class. The 24th class consists of those plants in which their fructifications are concealed, or at least not perceptible by the naked eye. Such are the *ferns*, the *mosses*, the *flags*, the *sea-wrack*, the *mushrooms*, &c.

It is quite impossible for us to enter into a further detail of the Linnean arrangement here: those who desire further information will of course consult the treatises specifically published on this important branch of natural history.

We may, however, in conclusion observe, that besides this artificial arrangement, naturalists have pointed out what they have called the *natural method* of classification, which they have divided into eight sections: namely, *fungi*, or *funguses; algæ*, or *sea-weed; musci*, or *mosses; lilia*, or *lilies*, with bulbous or tuberous roots; *palmæ*, or *palms; plantæ*, or *plants*, including every vegetable that cannot be arranged

under the preceding heads: they are *herbæ*, or *herbs*; *suffrutices*, or *undershrubs*; *frutices*, or *shrubs*; and *arbores*, or *trees*.

From the progress which botany has lately made, there is room for believing that the Linnean system will, in time, undergo such modifications as will amalgamate it with the *natural* method to which we have above adverted.

Next to the study of Botany that of

ZOOLOGY demands our especial notice. Under this important section of *Natural History* is comprised a knowledge of the forms, habits, manners, and uses of *animals*. Various writers have published treatises on Zoology; the chief however are LINNÆUS, BLUMENBACH, and CUVIER. We cannot enter into a detail of the different arrangements of these eminent naturalists; it will be sufficient for our purpose to observe, that the classification of Linnæus has been for a long time popular, but that Cuvier's, as well as Blumenbach's system, deserves also attention.

Linnæus arranges the whole animal kingdom under six *heads*, or CLASSES as follows:

The *first* class he names MAMMALLIA or MAMMALS; that is, all those animals as well *man*, as *quadrupeds* and some other animals, which *suckle their young*. They are distinguished by a heart having two ventricles and two auricles; the blood is red and warm; they are also viviparous. To this class belong the *horse*, *ass*, the *lion*, the *sheep*, the *ox*, and several other animals which live occasionally in the water, and some wholly in the sea, and hence usually considered as fish. Of *man* we have already treated in our first section, and to which therefore, page 2, the reader is referred. The amphibious animals, to which we have just alluded to as belonging to this class, are the *seal*, the *otter*, the *beaver*, the *hippopotamus*, &c. The mammalian fishes are the *whale*, the *narwhal*, the *dolphin*, the *porpoise*, &c.

The knowledge of the forms, habits, manners, &c. of *mammalian* animals is called

MASTOLOGY, or MAZOLOGY. Linnæus divides this class into *seven* ORDERS, and these again into many *genera*, *species*, and *varieties*. The orders are distinguished by the *number*, *structure*, and *situation* of the *teeth*.

The *first* order, PRIMATES, has four incisors or fore-teeth in each jaw, and one dog-tooth on each side of the incisors; the dog-teeth are consequently four, two in each jaw. This order consists of *four* genera only, namely, *man*; the *monkey*, &c; the *macauco*; and the *bat*.

The *second* order, BRUTA, has no fore-teeth in either jaw; it consists of *seven* genera, exemplified in the *rhinoceros*; the *elephant*; the *sloth*, &c.

The *third* order, FERÆ, has, for the most part, six conical fore-teeth in each jaw. Of this there are *ten* genera exemplified in the *seal*; the *dog*; the *cat*, *lion*, &c.; the *otter*; the *bear*; the *mole*; and *hedgehog*.

The *fourth* order, GLIRES, has two fore-teeth in each jaw, and no dog-teeth. *Ten* genera, of which the *porcupine*; the *hare* and *rabbit*; the *beaver*; the *rat* and *mouse*; the *squirrel*, &c. are examples.

The *fifth* order, PECORA, has no fore-teeth in the upper jaw, but six or eight in the under jaw. *Eight* genera, exemplified in the *camel*; the *deer*, *stag*, &c.; the *goat*; the *sheep*; the *ox*, &c.

The *sixth* order, Belluæ, has obtuse fore-teeth in each jaw. *Four* genera only; the *horse, ass*, &c.; the *hippopotamus;* the *pig;* and the *tapir.*

The *seventh* order, Cete, or Whale kind, has no uniform character in its teeth, but is distinguished from other mammalia by living in the sea, having pectoral fins and a fistula or spiraculum upon the head. *Four* genera; the *narwhal;* the *whale;* the *spermaceti whale;* and the *dolphin;* under which last are included the *dolphin*, the *porpoise*, and the *grampus.*

The *second* class is denominated Aves, or the Birds. They are distinguished as regards the blood and the structure of the heart, by the same characters as the first class; but they are also covered with *feathers*, and furnished for the most part with wings; they have also air cells in their bodies, and their bones are generally hollow, so that they have the means of diminishing their specific gravity, and thus of raising themselves in the air; they are besides *oviparous.* The knowledge of the forms, habits, manners, &c. of birds is called

ORNITHOLOGY. Perhaps no portion of natural history not even excepting *flowers*, is more calculated to arrest our attention than that which relates to birds. Not only are many of them extremely brilliant and beautiful in their plumage, but their exquisite *songs* have, in all ages, excited the admiration of mankind. Their *nests* too are many of them extremely curious in their structure.

"Who shall cope
With birds in architecture? Not nice skill
Of man's most practis'd hand; not all the lore
Of sages."

The nests of the *wren*, the *long-tailed titmouse*, the *oriole*, the *esculent swallow*, the *tailor bird*, &c. &c. are particularly deserving of notice. Many birds are, besides, extremely useful and agreeable to man as food; and when they can be obtained for such purpose, *without cruelty*, they form a pleasing variety of aliment with which, under the term *game*, our tables are often supplied. We have noticed some of the most important birds as aliments in page 67.

Linnæus arranged birds under *six* orders, the characteristics of which are chiefly taken from the structure of the bill.

The *first* order, Accipitres or Hawks, have a crooked bill; it consists of four genera only: the *vulture, condor*, &c.; the *falcon, eagle, hawks;* the *owl;* and the *shrike.*

The *second* order, Picæ or the Pies, have a convex, compressed bill resembling a knife. It consists of *twenty-three genera*, of which the *humming bird;* the *creeper;* the *crow, rook, raven, magpie*, &c.; the *toucan;* the *bird of paradise;* the *parrot;* the *woodpecker;* are examples.

The *third* order, Anseres or Geese, have a broad bill, and the feet are palmate or webbed; *thirteen* genera, exemplified in the *duck, goose, swan*, &c.; the *penguin;* the *pelican, cormorant*, &c.; the *gull.*

The *fourth* order, Grallæ or Waders, have a cylindrical bill, the tail is short, and the thighs naked. Many of this order have long legs and long bills. *Twenty* genera, exemplified in the *flamingo;* the *spoonbill;* the *ibis;* the *crane, stork, heron; woodcock, snipe*, &c.

The *fifth* order, Gallinæ, or Gallinaceous birds have a convex bill. The feet are divided, but connected at the inmost joint. *Ten*

genera, exemplified in all the tribe of *domestic fowls*, the *pheasant*, *peacock*, *turkey*, *guinea-hen*; *partridge*; *bustard*; *ostrich*, &c.

The *sixth* order, PASSERES or the SPARROW TRIBE, have a conical sharp pointed bill, the nostrils are oval, wide and naked. *Seventeen* genera, in which are found most of the birds of song, such are the *finch*, *thrush*, *lark*, and *warbler* tribes; the *redbreast*, the *bulfinch*, the *nightingale*, &c.

Later writers have considerably varied this arrangement, displacing some birds from one order and replacing them in another. They have also increased the number of the orders, and also that of the genera. The chief of those writers are Mr. Pennant, Dr. Latham, Brisson, Cuvier, and Mr. Vigors. The last mentioned gentleman has, in several luminous papers in the Linnean Transactions, explained the system which he advocates, namely, that birds may be most correctly arranged in groups or families of *fives*, from the most prominent to the most minute outlines. In accordance with this idea he names the largest and most comprehensive groups INSESSORES or PERCHING birds; RAPTORES or RAPACIOUS birds; RASORES or *birds* which *scratch* the ground to obtain their food; NATATORES or SWIMMING birds; and GRALLATORES or WADING birds.

Our limits preclude any further notice of this system here, further than to observe that, while it exhibits considerable ingenuity and learning, its universal applicability is not at present acknowledged by many of our most intelligent naturalists. We may just add that all the birds described by Linnæus do not amount to one thousand; but, such has been the activity of modern research, Dr. Latham, in his great work on birds, describes nearly five thousand; and there is no doubt that subsequent inquiry will add considerably to the number.

The *third* class is denominated

AMPHIBIA, or those animals which live both on land and in water. In this class the heart has but one ventricle and one auricle; the blood is red, but cold; inspiration and expiration in some measure voluntary. This class is divided into two orders: the *first*,

REPTILIA, has four feet, and breathes by the mouth. *Four* genera, namely, the *tortoise* and *turtle*; the *dragon*; the *lizard*, including, *lizards*, *crocodiles* and *alligators*; and *frogs* and *toads*.

The *second* order, SERPENTES, or SERPENTS, have no legs, but breathe by the mouth. It is divided into *six* genera, namely, the *rattlesnake*; the *boa*; *vipers*; *snake*; *amphisbæna*; and *cæcilia*. The bite of *rattlesnakes* and of the *viper* tribe is extremely poisonous. The poison is contained in tubular fangs resembling teeth placed without the upper jaw, protruded or retracted at pleasure, and surrounded with a glandular vesicle by which the fatal fluid is secreted. For the cure of the bite of serpents, see page 107. It is said, however, that only about one-fifth of the serpent tribe are poisonous.

The *fourth* class PISCES or FISHES, has the heart of the same structure, and blood of similar qualities with those of the amphibia; but fishes are distinguished by *branchiæ* or *gills*; and by having no voluntary command of their lungs. A knowledge of their forms, habits, manners, &c. is called

ICHTHYOLOGY. Fishes are divided into six orders, the characters of which are taken from the situation of the belly fins. The *first* order,

APODALIA, consisting of *eight* genera, has no belly fins. The *eel*;

the *gymnoti;* the *wolf-fish;* the *launce;* and *sword-fish,* are examples of this order.

The *second* order, JUGULARIA, has the belly-fins placed before the pectoral fins. *Five* genera, of which the *star-gazer;* the *cod* and *whiting;* and the *blenny* are examples.

The *third* order, THORACICA, has the belly-fins placed under the pectoral fins. *Nineteen* genera, exemplified in the *sucking-fish;* the *turbot, sole,* &c.; the *dory;* the *perch;* and the *mackarel.*

The *fourth* order, ABDOMINALIA, has the belly-fins placed behind the pectoral fins. *Sixteen* genera, exemplified in the *salmon, trout,* &c.; the *pike;* the *silver fish;* the *mullet;* the *flying-fish;* the *herring, shad, sprat, anchovy, pilchard,* &c.; the *carp, tench,* &c.

The *fifth* order, BRACHIOSTEGA, has the gills destitute of bony rays. *Ten* genera, of which the *sun-fish*; the *pipe-fish;* the *file-fish,* are examples.

The *sixth* order, CHONDROPTERIGIA, has cartilaginous gills. *Five* genera, exemplified in the *sturgeon;* the *shark;* the *ray, skate,* and *torpedo;* and the *lamprey.*

The *fifth* class, INSECTA or INSECTS, are distinguished by a heart having one ventricle but no auricle; the blood is cold and white; this class has also *antennæ* or *feelers.* A knowledge of the forms, habits, manners, &c. of insects is termed

ENTOMOLOGY. Insects are divided into *seven* orders, the characters of which are taken from the wings.

The *first* order, COLEOPTERA, has four wings, the two superior ones being crustaceous and furnished with a straight suture. *Fifty-four* genera, of which the *beetle, cockchafer,* &c.; the *stag-beetle;* the *lady-bird;* the *glow-worm;* and the *Spanish fly,* are examples.

The *second* order, HEMIPTERA, has four wings, the two superior ones being semi-crustaceous, having the interior edges lying above one another. *Fourteen* genera, exemplified in the *cock-roach;* the *cricket, grasshopper,* &c.; the *bug;* the *lanthern-fly;* and the *cochineal insect.*

The *third* order, LEPIDOPTERA, has four wings, all of them imbricated with scales. *Three* genera, consisting of the *butterfly;* the *hawk-moth;* and the *moth.* The *butterfly* consists of almost innumerable species: the *moth* genus is also very numerous, including the *silk-worm.*

The *fourth* order, NEUROPTERA, has four wings interwoven with veins like a piece of network, and no sting in the anus. *Seven* genera, exemplified in the *dragon-fly;* the *May* and *day-fly;* and the *lion-ant.*

The *fifth* order, HYMENOPTERA, has the same character as the last, only the anus is armed with a sting; this mark is however peculiar to the females and those commonly called neuters, which are, most probably, imperfectly developed females; the males have no sting. *Fifteen* genera, of which the *gall-fly;* the *wasp;* the *bee,* &c.; and the *ant,* are examples.

The *sixth* order, DIPTERA, has two wings and two elevated halters or balances behind each wing. *Twelve* genera, of which the *common fly;* the *gnat;* the *humble bee;* and *gad-fly* are examples.

The *seventh* order, APTERA, has no wings. *Fifteen* genera, of which the *louse;* the *flea;* the *spider;* the *crab, lobster,* &c.; the *wood-louse;* the *centipede;* and the *scorpion,* are examples.

Besides this arrangement, it should be observed, that Mr. Mac Leay has lately called the attention of the scientific world to a *Quinary* arrangement of insects, similar in kind to that mentioned under ornithology; indeed Mr. Vigours admits that it was Mr. Mac Leay who first excited his attention to the quinary arrangement of birds. We can do no more here than refer the curious to the various scientific publications in which such subjects are usually treated of and explained.

In conclusion on insects it should be mentioned, that they exist generally in four states; first as an *egg*, which is commonly hatched by the summer or other heat; next as a *worm* or larva, when it devours most greedily the food suited to it; next it becomes a *chrysalis*, in which it remains dormant a certain time, after which it becomes a fly, beetle, moth, or other animal with wings, in which state it propagates its species and dies. Many insects envelope themselves in a fine web, previously to their going into the chrysalis state. The *silk worm* is a beautiful exemplification of the different stages of an insect.

The *sixth* class of animals, Vermes or Worms, have the same character as the fifth class; this class has, however, no *antennæ*, but it is furnished with *tentacula*. The knowledge of their forms, habits, manners, &c. is called

HELMINTHOLOGY.—Worms are divided into *five* orders.

The first order Intestina, found often in the intestines of various animals, is the most simple of animals, being perfectly naked, and without limb of any kind. *Twenty-one* genera, exemplified in the *ascarides* or *thread-worm;* the *Guinea worm;* the *gourd worm* or *fluke;* the *tape-worm;* the *leech;* and the *earth worm.*

The *second* order, Mollusca, is likewise a naked simple animal, but is brachiated, or furnished with a kind of limbs. *Thirty-one* genera, exemplified in the *slug snail;* the *cuttle fish;* the *star fish;* the *sea hedgehog*, &c.

The *third* order, Testacea, has the same character as the last order, but is covered with a shell. *Thirty-six* genera, of which the *cockle;* the *oyster;* the *house snail;* the *limpet;* the *cowrie;* the *nautilus;* the *whelk*, &c. are examples.

The *fourth* order, Zoophyta, consists of compound animals, furnished with a kind of flowers, and having a vegetating root and stem. *Fifteen* genera, exemplified in *coral;* *sponge;* the *polypus;* *tubipores;* *madrepores;* and the *Medusa* or *sea blubber*, and *sea-nettles.* See page 157.

The *fifth* order, Infusoria, consists of very minute simple animals, many of which exist in water and other fluids, and not commonly cognizable by the naked eye. *Fifteen* genera have been described of which the genus *vorticella* or *wheel animal* is not the least curious. Another, the *vibrio* or *vinegar eel*, is often seen in that fluid by the assistance of a microscope.

In concluding this Epitome of Animal Natural History it should be observed, that although we have given the number of the *genera* under each *order*, our limits prevent us from giving the number of the *species* under each *genus;* that, in consequence of the knowledge flowing in upon us from various quarters, the number of the genera is gradually, the number of the species rapidly increasing and that the number of the genera, as well as species mentioned by naturalists, must be considered as only an approximation to the number actually in existence. In truth, the animal as well as vege-

table creation affords a never-ceasing fund for the inquiry and employment of the human mind.

We now come to that department of natural history in which we learn the forms, nature, and uses of inorganic matter, usually denominated, in consequence of many of the bodies being obtained from *mines*,

MINERALOGY. Till lately, this science was without order or connection, but WERNER has thrown much light upon this branch of natural history, and Professor MOHS has lent his aid in rendering it more popular and intelligible. The last mentioned writer arranges minerals under three divisions or CLASSES.

The characters of the bodies in the FIRST CLASS, are, if solid, sapid; no bituminous odour; specific gravity under 3.8. This class consists of *four* orders, of which *gas*, expansible, but not acid, forms the *first*, and consists of *two* genera, *hydrogen* and *atmospheric* air. The *second* order is WATER, *one* genus, *atmospheric water*, specific gravity 1. The *third* order is ACIDS; specific gravity from 0.0015 to 3.7; the genera *five*, the *carbonic*, the *muriatic*, the *sulphuric*, the *boracic*, and the *arsenic* acids. The *fourth* order is *salt*, not acid; specific gravity from 1.2 to 2.9. The *genera* of this order are *ten*, of which *common salt*, *Glauber's salt*, *saltpetre*, *muriate* of *ammonia*, the *sulphates* of *iron*, *zinc*, and *copper* are examples.

The bodies constituting the SECOND CLASS are insipid; their specific gravity is above 1.8. They consist of *thirteen* orders. . The first is HALOIDE or *salt-like; five* genera, of which *gypsum alum*, and *fluor haloide* are examples. The second order is BARYTE, with *five* genera, of which *zinc-baryte* and *lead-baryte* are examples. The *third* order is KERATE or Horny, consisting of *one* genus. The *fourth* order is MALACHITE, consisting of *six* genera. The *fifth* order is MICA or TALC, consisting of *seven* genera. The *sixth* order is spar, consisting of *nine* genera, of which *felspar* is an example. The *seventh* order is GEM, consisting of *thirteen* genera, of which the *diamond*, the *topaz*, the *emerald*, the *garnet*, and *corundum* are examples. The *eighth* order is ORE, consisting of *eleven* genera, of which *tin-ore*, *iron-ore*, *zinc-ore*, and *copper-ore* are examples. The *ninth* order is METAL, consisting of *ten* genera, of which *arsenic*, *antimony*, and *gold* are examples. The *tenth* order is PYRITES, consisting of *five* genera, of which *cobalt-pyrites* and *copper pyrites* are examples. The *eleventh* order is GLANCE, consisting of *eight* genera, of which *copper-glance*, *silver-glance*, and *lead-glance* are examples. The *twelfth* order is BLENDE, consisting of *four* genera, of which *glance-blende* and *garnet-blende* are examples. The *thirteenth* order is SULPHUR, consisting of *one* genus only.

The bodies constituting the THIRD CLASS, if fluid, have a bituminous odour, if solid, they are insipid. The specific gravity of bodies in this class is under 1.8. It consists of *two* orders. The *first* order is RESIN, consisting of *one* genus, either fluid or solid, yellow, brown, or black. The *second* order consists of *one* genus, MINERAL-COAL, containing of course many species and varieties. Such are the outlines of the system of mineralogy delineated by Professor Mohs. We ought also to mention that Werner divides the mineral kingdom into EARTHS, SALTS, INFLAMMABLES, and METALS; but we cannot enter into a detail of his arrangement. A description of many of the articles above named will be found in the preceding pages of this work.

From mineralogy the transition to *Chemistry* is almost imperceptible; it is our intention to make a few observations on this interesting and important science; but before we do so, as

GEOLOGY most naturally follows mineralogy, we shall detain the young student here while we make a few remarks upon it. Geology implies that science which teaches us the structure of the earth—of the globe which we inhabit. This science, as a science, is of very modern date. That the present surface of the earth has been, at some remote period, covered with water, we cannot for a moment doubt, as numerous marine productions found on various parts of the land, and even on hills, decidedly evince. Thus confirming, in the opinion of the generality of mankind, the Mosaic account of the deluge. WERNER, one of the most intelligent of the philosophers who have written on this subject, supposes that the globe was once covered with a sort of chaotic compost, holding either in solution or suspension the component parts of the various rocks and strata which now present themselves as its exterior crust. Of what the interior of the earth consists we are wholly ignorant, not having penetrated but a very little way from its surface towards the centre. The substances of which this exterior crust is composed have been arranged under FIVE CLASSES. The *first* class has been named PRIMITIVE ROCKS, because it is assumed that they were first formed; they contain neither animal nor vegetable remains, nor even rounded pebbles; such are *granite, serpentine,* and *porphyry.* In the strata lying immediately upon the primitive rock, shells and fragments occasionally occur; this class is termed TRANSITION ROCKS. They consist of *transition lime-stone, Greywacke,* &c. The next class is called FLOETZ or *secondary rocks,* which are deposited upon the transition rocks in horizontal layers, and they abound in organic remains. It is also supposed that agencies of the wind, the weather, and the ocean, produced inequalities of surface, that the water retreated into lowlands and valleys, where a further deposition took place, consisting of sand, gravel, loam, clay, &c. &c. This is called ALLUVIAL ROCKS. The last class is called VOLCANIC ROCKS—the product either of false or of true volcanoes.

These processes, together with innumerable convulsions arising from earthquakes, volcanoes, and other causes, are esteemed sufficient to account for the present condition and appearance of the crust of the globe. Whatever be the fact, and we see no reason to question the principal positions above stated, we think it manifest that all rocks, not excepting even the primitive ones, were once in a state of solution or liquidity, so as to admit of the innumerable forms and crystallizations in which they now appear. The more this subject is investigated, the more reason we shall see for admiring the numerous phenomena with which this part of creation abounds. Geology will be found, at all times, a pleasing and instructive study.

CHEMISTRY is that science which investigates the composition of material substances, and the permanent changes of constitution which their mutual actions produce. Hence it is clear that there is no body, having material existence, which might not be the subject of chemical research. Chemistry is therefore, at once, the most universal and most useful of all the natural sciences, and with all other natural science is and ever must be intimately and indissolubly connected. It has been taught by different methods. Mr. BRANDE, whose luminous *Manual of Chemistry* has obtained considerable celebrity, treats, first, *of the powers and properties of matter and the general laws of chemical changes,* under these heads, namely, *attraction, heat,* and *electricity;* next of *imponderable matter* or *light;* then of the *simple support-*

ers of combustion, such are *oxygen*, *chlorine*, and *iodine*; next of *simple acidifiable and inflammable substances*, such are *hydrogen*, *nitrogen*, *sulphur*, *phosphorus*, *carbon*, and *boron*. Under these sections, some of the most important combinations in nature are explained; such is *water*, the *mineral acids* and their *combinations*, *charcoal*, the *gases*, *&c. &c.* In the next section he treats of *metals and their combinations*; in the next of *vegetable substances*, particularly *gum*, *sugar*, *starch*, *gluten*, *extractive matter*, *tannin*, *wax*, *fixed and volatile oils*, *resins*, *vegetable acids*, *the phenomena and products of fermentation*, *alcohol*, *vinegar*, *&c.* Next of *animal substances*; among which are the *blood*, *albumen*, *milk*, *bile*, *urine*, *gelatine*, *muscle*, *fat*, *shell*, *bone*, *&c.* *Animal functions*, *digestion*, *respiration*, *chyle*; concluding with a compendium of *geology* and *observations* on *soils*, with copious tables of *specific gravities*.

We have preferred giving an analysis of Mr. Brande's manual to that of making any observations of our own, because we believe that the student who is desirous of obtaining a correct insight into chemistry, cannot do better than consult that work. It is, in our deliberate judgment, the most compendious treatise that has yet appeared on this interesting science, concerning which we cannot say more here, but must refer the reader to the numerous articles connected with the subject in the preceding parts of our epitome, not omitting attention to the introductory paragraph, and also to many which will follow in the present section.

The step from Chemistry to

PHARMACY is scarcely perceptible; while the former treats of all natural substances animate and inanimate, pharmacy teaches only the method of preserving and preparing those which are useful as medicines. It is divided into the *method of collecting and preserving simples*—*weights and measures*—*chemical operations and results*; and *pharmaceutical preparations*. These are either directed by the *London College of Physicians*, who publish a book, which is occasionally revised and altered to suit the improved state of knowledge, called the *Pharmacopœia*, or *Dispensatory, of the Royal College of Physicians*; or, by some physician or other person competent to direct such manipulations. It is not expected that the general reader will enter minutely into a knowledge of this part of chemistry, but as no one can be exempt from the diseases which afflict humanity, some attention to medicines and their composition will be found useful; with this view we have given a compendious sketch of the most important medicines in the preceding parts of our work, to which of course the reader will refer. The list of these medicines is called, in common language, the *materia medica*, or the matter of medicine. The distinctions of *chemical* and *galenical* pharmacy are now no longer retained.

SPECIFIC GRAVITY,—a term in much use with chemists and other philosophers, is the relative, comparative, or apparent gravity of any body, in respect of that of an equal bulk or magnitude of another body; denoting that gravity or weight which is peculiar to each species or kind of body, and by which it is distinguished from all other kinds. The specific gravities of bodies are usually stated in whole numbers and decimal parts, that of water being stated as one, except as relates to the gases; when atmospheric air is the unit. We add

THE SPECIFIC GRAVITIES OF THE MOST COMMON SUBSTANCES.

ACID, acetic	1.062
——Arsenious	3.728
——muriatic	1.200
——nitric	1.271
——sulphuric	1.850
Alcohol (pure)	.797
Alum	1.714
Barytes, sulphate of	4.865
Basalt	3.000
Blood, human	1.053
Butter	.942
Chalk	2.675
Coal fr. 1.020 to	1.300
Cyder	1.018
Diamond	3.521
Ether, sulphuric	.632
Fat of Beef	.923
Felspar	2.700
Flint (black)	2.582
Gases: Atmospheric air	1.000
Carbonic acid	1.527
Carburetted Hydrogen	.972
Chlorine	2.500
Hydrogen	.069
Nitrogen	.972
Oxygen	1.111
Prussic acid	.937
Glass (flint)	3.000
Granite, from 2.613 to	2.956
Gunpowder, solid	1.745
—— —— loose	.836
Gypsum	2.288
Honey	1.450
Iron stone (Carron)	3.231
Lead glance	7.786

Limestone, compact	3.000
Marble Carrara	2.716
—— Parian	2.560
Metals: Antimony	6.702
—— Arsenic	5.763
—— Bismuth	9.830
——Brass	8.306
——Cobalt	8.600
——Copper	8.900
——Gold, cast	19.25
—— —— hammered	19.35
——Iridium, hammered	23.00
——Iron, cast	7.248
—— —— bar hardened	7.788
——Lead	11.35
——Manganese	8.000
——Mercury (solid)	15.61
——Mercury at 32 Fahr.	13.61
——Platinum	21.47
——Potassum	.865
——Silver	10.49
—— ——hammered	10.51
——Sodium	.972
——Steel hardened	9.840
——Tin	7.291
——Zinc from 6.900 to	7.191
Mica	2.934
Milk	1.032
Naphtha	.700 to .847
Nitre	1.900
Oil, ess. of Amber	.868

——Caraways	.904
——Cinnamon	1.043
——Cloves	1.036
——Lavender	.894
——Turpentine	.870
——expressed of Lintseed	.940
Olives	.915
Opium	1,336
Pearl (Oriental)	2.750
Phosphorus	1.770
Plumbago	2.400
Porcelain (China)	2.384
Porphyry	2.972
Quartz, from 2.624 to	3.750
Spar, fluor	3,791
Spermaceti	.943
Steam of water	.481
Stone, paving	2.708
—— Portland	2.496
Sugar	1.606
Sulphur (native)	2.033
Talc	3.000
Vinegar from 1.013 to	1.080
Water distilled	1.000
—— of the sea	1.028
Wax (bees)	.964
Wine, Port	.997
—— Champagne	.997
Wood, Ash	.845
—— Box (Dutch)	1.398
—— Lignum Vitæ	1.333
—— Mahogany	1.063
—— Oak, heart of, sixty years old	1.170

ANATOMY teaches the situation, figure, connexion, fabric, actions, and uses of the several parts of the animal body; it is applied more particularly to the human frame. The dissection of other animals, and comparing them with the human body, is called *comparative anatomy*.

The utility of anatomy is such, that no one who gives the subject the least reflection, will deny its paramount importance to the well-being of man. Who would trust a surgeon to amputate his limb if he were not convinced that the surgeon was well acquainted with the

structure of that upon which he operates? As, therefore, a knowledge of anatomy is essential to the education of a medical man, and most of all of a surgeon, it is evident that such knowledge cannot be obtained without practice upon dead bodies, in order that such knowledge may be acquired. Considerable repugnance has always been manifested, by the illiterate and uninformed, to the dissection of the dead; but it is sincerely hoped that, as knowledge becomes more diffused, and the conviction of its absolute necessity more generally prevails, such prejudices will in time be done away; and that, while anatomy be pursued with decency and privacy, and some restrictions removed which now prevent the obtaining of subjects, anatomical dissection will be rendered at once, and for ever, legitimate, respectable, and meritorious.

In regard to the structure, &c. of the human body, a description of its principal parts will be found page 3, and the following to page 17, to which the student will please to refer.

Anatomy has been occasionally divided into sections for its more convenient study: thus, *osteology* treats of the *bones; neurology* of the *nerves*, (see PHRENOLOGY, page 6,) and *myology* of the *muscles*, &c.

MEDICINE, the art or science of curing diseases. Notwithstanding much extensive experience, and the number of recorded facts concerning this important branch of science, it must with sorrow and humility be admitted, that the art of curing diseases is still in comparatively a very imperfect state. It is true the collateral sciences, botany, chemistry, pharmacy, and anatomy, have been followed with much perseverance and considerable success, but an unerring outline of the healing art yet remains a *desideratum*.

While BROWN, DARWIN, and their followers say, that only *two* orders of general disease exist, namely, *one* in which *the abstraction of stimuli*, and the other in which *the addition of stimuli* is necessary to the removal of the disease; others seem to consider every disease as one of a peculiar nature occurring in each individual, and therefore to be treated without much, if any, regard to generalization; or whether, with Dr. CULLEN and others, diseases may be arranged under numerous classes, orders, genera, species, and varieties; certain it is, that no plain and simple classification and system has yet been made public by which this great, this momentous art may be acquired. That all is not conjecture we may, however, confidently affirm; and if the theories of Brown be not correct, we still think that attention to them will be most likely to lead us into the right path. That there is much affectation and a parade of mystery in the profession of medicine, there can be no doubt. The best antidote for these is the *general diffusion of knowledge* among all ranks of society, by which the ability of the scientific medical practitioner may be properly appreciated, and the pretensions of ignorance and quackery set at nought. Of an art for which we entertain unfeigned respect, we feel it our duty to say thus much; while we are precluded by our limits from entering into any detail. At the same time we confidently recommend our descriptions of medicines in the preceding portions of our work, and more especially those under the head of *Gases*, *Poisons*, *Hydrophobia*, *Scalds*, *Burns*, and *Drowning*, as well as the various articles on antimony, to the serious attention of our young readers.

SURGERY is usually defined that part of medicine which attempts

the cure or alleviation of disease by external treatment, and in which manual operation is essentially concerned. This portion of the healing art has arrived at much greater perfection, especially as regards the performance of operations, than other branches of the science. Surgery involves a knowledge of two distinct kinds—the anatomical and the operative, without both, no one can become a good surgeon. The chief error in the education of the surgeon of the present time is, its being confined to those branches of knowledge; whereas the most able surgeon ought also to possess the knowledge of the physician. To the great credit of some modern surgeons, they have availed themselves of all the experience which the different branches of the profession afford: we find in Mr. Abernethy at once an able surgeon and an intelligent physician.

The *members* of the *medical profession* are usually arranged under *three* divisions; the

APOTHECARY, who dispenses the medicines ordered by the physician; and who, on ordinary occasions, visits the sick, and prescribes for them; in this class may also be arranged the *Surgeon and Apothecary*, terms applied to a large class of medical practitioners, who, in numerous instances, act as surgeons or apothecaries, as the case may be.

SURGEONS, who confine themselves to the cure of local diseases and manual operations; such are those attendant on most of our great hospitals; and

PHYSICIANS, who have a diploma to practise from some college or university, and who only prescribe, but never dispense the medicines which they themselves order.

An apothecary cannot now practise as such, in England and Wales, unless he has been examined at Apothecaries' Hall, and has obtained a certificate of his fitness, under a penalty of 20*l*.

It is also customary for surgeons to undergo an examination at the College of Surgeons, before they practise as such, but omitting to do so does not, we believe, subject them to any penalty.

No *physician* can practise in London, or within seven miles thereof, without a license from the Royal College of Physicians of London.

Besides these, as a component of the medical profession, there is also the Chemist and Druggist, who not only prepares medicines, but dispenses the physicians' prescription as an apothecary.

In all these, some knowledge of the Latin language is indispensable; and certain it is, that without an acquaintance with anatomy, botany, and chemistry, no one can expect to excel in his profession as a medical man.

Philosophy, Natural Philosophy, Physiology, &c.

PHILOSOPHY is a word derived from the Greek, and literally implies *a love of wisdom*; it, however, usually means the more recondite kinds of knowledge, as well *physical* and *metaphysical* as *moral*. Cicero calls it *scientia rerum divinarum et humanarum cum causis*; *i.e.* the knowledge of divine and human things with their causes; Lord Bacon calls it *interpretatio naturæ*. The principal objects of philosophy are God, nature, and man. That part of it which relates to God is

usually denominated *theology;* that which treats of nature, *physics metaphysics ;* and that which treats of man, *logic* and *ethics*, or *moral philosophy*. It is clear, that philosophy is, after all, a very vague term; it is usually assumed, however, to imply knowledge founded on the best *data*, obtained by considerable reflection, and of the most important, valuable, and useful kind.

NATURAL PHILOSOPHY, or PHYSICS, that science which instructs us concerning the properties and operations of the material universe. To be able to account for the phenomena of nature, to explain the beauty, order, and harmony, the symmetry and magnificence of the terrestrial and celestial worlds, is a pleasure which none but thinking men can adequately enjoy, and of which none but the inconsiderate would desire to remain ignorant. It is true, the most careless observer must be struck with innumerable occurrences and objects, which are continually presented to his notice; but to explain the causes of many of such occurrences, is reserved for those only who are disposed to examine patiently and accurately, to weigh and to compare a vast variety of facts, and thence to deduce those conclusions which true philosophy, genuine wisdom only can warrant us in adopting.

The ancients only approached the threshold of that temple of science into which the moderns have been permitted to enter; yet, although our knowledge of the natural sciences far exceeds the ancients, we must not imagine that all the paths of nature are explored—far from it; Nature, we may be assured, is furnished with inexhaustible resources, and will for ever supply abundant employment for the unwearied energies of man. For

> "What was once
> Incontrovertible, is overthrown;
> And what now *seems* built on the base of truth
> Perchance shall pass as stubble which the fire
> In one full blast consumes."

In short, such is the activity of inquiry now going on amidst the various departments of natural science, that it is quite impossible to say where or when those inquiries will terminate. New facts, and new views resulting from them, are continually presenting themselves, and producing at once surprise, pleasure, and instruction. We have already, in our preceding articles, detailed many of the important results of modern philosophy, and in what follows, it shall be our object to add to the store-house of thought—to the improvement and elucidation of our being. See forwards PHILOSOPHY and PHILOSOPHERS.

We may conclude this article in the words of Addison: "The creation is a perpetual feast to the mind of a good man; every thing he sees cheers and delights him; Providence has imprinted so many smiles on nature, that it is impossible for a mind, which is not sunk in mere gross and sensual delights, to take a survey of them without sensations of pleasure."

PHYSIOLOGY, in its proper and literal meaning, implies the science of nature or physics; in fact, the same as *natural philosophy*, of which we have just treated in the preceding article. But it is used, at the present time, in a much more restricted sense, implying the

science of organized life, whether as regards *plants* or *animals;* indeed it is sometimes confined to animals alone, and approaches, in many of its details, the science of anatomy. The chief writers on *vegetable* physiology are *Willdenow*, *Mirbell*, *Smith*, *Darwin*, and *Knight*. *Vegetable* physiology teaches the structure and functions of the various parts of plants. *Animal* physiology proceeds in the same manner with animals. Different arrangements of animals have been proposed for the greater simplification of the study of this science, but we cannot enumerate them; it will be sufficient to observe, that physiologists have arranged the *functions or properties of living bodies* under *nine classes*, namely, *digestion*, *nutrition*, *circulation*, *respiration*, *secretion*, *ossification*, *generation*, *irritability*, and *sensibility*. And that every body, in which one or more of these functions are observed, is to be considered as possessing organization and life. Some of the most able physiologists of modern times are *Haller*, *Daubenton*, *Vic d'Azyr*, *Richerand*, *Blumenbach*, and *Cuvier*, to whom may be added of our own countrymen, *Ray*, the *Hunters*, the *Monros*, *Darwin*, Sir *Everard Home*, &c. &c. Physiological researches, whether in the animal or vegetable kingdom, are always interesting, and furnish inexhaustible pleasure, amusement, and instruction.

Before we proceed further in explanation of philosophical science, it may be useful to notice a few terms and things with which philosophical disquisitions are occasionally mixed.

By the *occult sciences* is understood, *magic*, *necromancy*, *cabbala;* &c. Magic is a science which deceptiously professes to teach how to produce some wonderful effect out of the common course of nature. The ancient *Magi*, from whom the word magic is derived, engaged in astrology, sorcery, &c.; and hence the term magic became odious. The existence of magic is of course not credited, nor are its pretensions ever countenanced in intelligent society. *Necromancy* pretends to call up the dead, devils, &c., and to extort answers from them. *Cabbala*, the words, numbers, letters, &c. used in the Jewish magic; they have, of course, no better foundation than other magic. The term is also applied to the abuse of the Scriptures by the visionary in pretending by words, &c. to foretel future events.

Primum mobile, or *first mover*, is the ninth or highest sphere of the heavens in the Ptolemaic system of astronomy, the centre of which is the earth. But the motion of the heavenly bodies is now much more satisfactorily accounted for. See forwards, ASTRONOMY. *Primum mobile* is also occasionally used for *first cause*, without any reference to astronomy.

Physical causes are those qualities and conditions which belong to natural bodies, both animate and inanimate. *Physical* causes, in man, are contradistinguished from *moral* causes; both are, however, intimately connected, and it is sometimes very difficult to distinguish them apart.

Moral causes imply those circumstances which are fitted to operate upon the mind, as *motives* or *reasons*, and which produce peculiar habits and manners. Such are, *government*, *religion*, *a particular kind of education*, *much seclusion from, or much admixture with the world; poverty*, *affluence*, *&c.*

MENTAL PHILOSOPHY.

METAPHYSICAL PHILOSOPHY, or METAPHYSICS. These terms have been and still are occasionally derided and abused. Like other latitudinarian terms, they are very liable to be misunderstood. We shall not enter into the various explanations which have been given of the term metaphysics ; it will be sufficient for our purpose to state, that by it we understand that science which treats of *immaterial being* in general, and chiefly that which explains the *nature and operations of the human mind.* We ought however to state, that it is sometimes called PNEUMATICS, under which head are included *God*, *angels*, and the *human mind*, &c. But *pneumatics* are now more usually considered a natural science which treats of the different kinds of air, the atmosphere, &c. See BAROMETER, THERMOMETER, AIR-PUMP, &c.

This science is sometimes called ONTOLOGY, implying the doctrine of *being*. Aristotle was the first who wrote professedly on the subject; having treated of natural objects, he afterwards proceeded to treat of those of the mind, &c.; and named them *metaphysics* merely from the position which they occupied in his work. Of the numerous modern writers on metaphysics we can only name, LOCKE, HARTLEY, and the late Dr. BROWN of Edinburgh. These and many others will be doubtless consulted by the curious on this subject; but no metaphysical writer with whom we are acquainted is without numerous errors: hence the present imperfection of this science. See what is said on *Phrenology*, the *Human mind*, and the *Passions*, in the First Part of this Work.

PHRENOLOGY, sometimes called CRANIOLOGY, is that science which teaches the nature and operations of the mind by an examination of the structure, and a knowledge of the uses of the different portions of the brain. This science is of recent developement; for some time it met with great opposition, and has been assailed with all the weapons which wit and ridicule could command, but it still continues its progress; and although we cannot assent to all which the phrenologists assert, we believe its main positions are founded in truth. For practical purposes, and accordant with the limits of our work, what has been already stated concerning this science, in pages 7, and 8, will be sufficient; to these the student will of course refer.

PHYSIOGNOMY, the science which teaches us the dispositions of mankind by observing the form and features of the face; it sometimes includes, also, the form of other parts of the body besides the face; but it is most commonly confined to this conspicuous index of the mind. ARISTOTLE is one of the most ancient physiognomists; LAVATER has excited great attention among the moderns; latterly, however, the study of physiognomy has given way to phrenology; we think that both should be studied together; and that both, with suitable precaution, may be made useful in improving the human character. We cannot doubt that very often the state of the mind is seen in the countenance; nor can we doubt that where the same state of mind is continued for a long period, that that state will sometimes produce certain permanent relaxation or contraction of the mus-

cles of the face, which in time becomes habitual, and wholly beyond our voluntary control. Thus, the envious, the proud, the supercilious, will often declare themselves notwithstanding all their efforts to the contrary. Who can doubt that grief, melancholy, and sombre religion, often affects in a permanent way the human countenance? Nay, such are the effects of the human countenance upon us, that almost every one, the moment he sees a person, has an impression of him, either of a favourable or of an unfavourable kind. But whence such impressions arise we are not always exactly aware, although we can have no doubt of the fact. While it is admitted that this science is in its cradle, its very infancy, it must be at the same time conceded, that there is great probability, when it is combined with phrenology, as above stated, that both may mutually assist and explain each other.

MORAL PHILOSOPHY, or Ethics. The science of manners, or that knowledge which informs us what are the *duties* which we owe to all mankind: our duty to God is taught us by *religion*. Yet ethics often include this term. (See forwards, Theology and Religion.)

The object of all human action, as regards moral purposes, is happiness; those actions which most effectually promote happiness must be the best. Hence arise innumerable Duties in our intercourse with mankind; that is, those actions which *ought to be performed*, because they are productive of happiness: to suppose a *duty* without an object in its performance, is absurd. Hence *virtue* is to be preferred to vice because it produces happiness; *vice*, on the contrary, is productive of misery, and ought therefore always to be avoided.

In the performance of our social duties, one of the best guides will always be active and warm Benevolence—that is, a kindliness of feeling and of acting towards the whole human race. It is this feeling, rightly directed, which will do more towards softening the asperities of our nature, than laws however penal, than actions however vindictive; indeed it has been well expressed by the founder of the Christian religion, when he directs us, to *Love our neighbour as ourselves;* and *to do unto all men as we would they should do unto us.*

LOGIC is the art of thinking and reasoning justly. Logic contains certain rules for reasoning accurately on any subject; and although this art has been abused, yet there can be no doubt, if properly studied, it will enable the mind to marshal the thoughts more clearly and intelligibly.

A *syllogism* in logic consists of *three* propositions, the *major*, the *minor*, and *consequent*, thus:—*a number that can be divided into two equal parts is an even number;—eight may be divided into two equal parts; therefore eight is an even number.*

Geography, Astronomy, etc.

GEOGRAPHY, the science that teaches and explains the nature and properties of the earth as to its figure, place, magnitude, motions, &c. with the various lines, real or imaginary, on its surface, its divisions into land, water, islands, kingdoms, states, seas, mountains and their productions, &c.

Although geography may be taught without maps, it is most con-

veniently elucidated by the aid of such auxiliaries. It is not consistent with our plan to introduce these. We may, however, just mention, that geography is usually treated of under four grand heads, namely, *Europe*, *Asia*, *Africa*, and *America*, to which has been lately added, *Australasia*, and the *Polynesian Islands* in the *Pacific Ocean*, which, and the *Atlantic* and *Indian* oceans are the chief seas of the globe, connected as they, of course, are with many minor seas: such are the *Baltic*, the *Mediterranean*, the *Euxine*, the *Red*, the *Icy Seas*, &c. &c.

Perhaps there is no study more productive of rational amusement than that of geography. Indeed, so far has the diffusion of knowledge extended, that the merest schoolboy is now no longer ignorant of the chief geographical positions on the globe. He who cannot tell the names of the chief cities of the European states is now accounted a dunce; and if, at the same time, he cannot enumerate the principal rivers in the world, such as the *Amazon*, or *Maragnon*, the *La Plata*, and the *Oronoco* in South America; the *Mississippi*, the *Missouri*, the *Ohio*, and the *St. Lawrence* in North America; the *Nile*, the *Niger*, the *Senegal*, the *Gambia*, and the *Congo* of Africa; the *Danube*, the *Po*, the *Rhone*, the *Rhine*, the *Elbe*, the *Vistula* of Europe; and the *Volga*, the *Euphrates*, the *Indus*, the *Ganges*, the *Hoang Ho*, and *Kian Ku* of Asia; his credit for such knowledge will not be greatly increased. Nor, if ignorant of the names of the highest *mountains* in the world, will he be, for this ignorance, particularly esteemed. Of these, however, we may just observe, that some of the elevations of the *Himalaya* chain, in the East Indies, are the highest yet discovered; one of them being, by the most accurate accounts, 25,000 feet above the level of the sea; while *Chimborazo*, the highest peak of the Andes, in South America, is only 20,280 feet above the same level; *Mount Rosa*, in the Alps, only about 16,600 feet; *Mont Blanc*, another Alpine mountain, only 15,600 feet; the *Pic of Teneriffe*, 14,026 feet; *Mount Etna*, 10,954; and *Ben Nevis*, in Scotland, the highest British mountain, only 4,370 feet above the level of the sea.

Besides the pleasure derived from the study of *modern*, many are also to be obtained from a contemplation of *ancient* geography. This last, in combination with *chronology*, being essential to the elucidation of *history*. Who does not dwell with delight upon the places and on the times in which great men lived, and great actions were performed? Who can read of Egypt and the Nile; of Pharaoh and the Pyramids; of Palestine and Jerusalem; of the Jews and Jesus Christ; of Greece, Plato, Demosthenes, and a host of other Grecian sages; of Rome, Cato, Pompey, Cicero, Cæsar, Virgil, Horace, and Augustus, without emotion and anxiety to learn where they lived and died, and where are situated the places in which some of the most important deeds have been achieved?* See forwards WONDERS, &c.

ASTRONOMY, that science which instructs us in the knowledge of the heavens and the heavenly bodies, as the sun, moon, planets, the fixed stars, &c. *Planets* are stars which revolve round the sun, as well as on their own axes, and receive their light from him, being themselves dark opaque bodies like our earth. The planets, together with the earth, compose what is called the *solar system*. The sun

* The compiler of this volume has published an interesting *manual* of Geography, expressly adapted to the purposes of the young student, entitled *Guy's School Geography*.

being the centre of this system, the planets all revolve round him in certain periods of time; thus *Mercury*, being nearest the sun, completes his revolution around that luminary in about eighty-eight days; *Venus*, in 224 days; the *Earth* in 365 1-4 days; *Mars*, in about 687 days; *Ceres*, in 1680 days; *Pallas*, in 1681 days; *Juno*, in about 2007 days; *Vesta*, not known; *Jupiter*, in 4332 days; *Saturn*, in 10,759 days; and *Uranus*, *Gaorgium Sidus*, or *Herschell*, in 30,689 days. *Uranus* was discovered by the late eminent astronomer Dr. *Herschell* in the year 1781. *Ceres*, by M. *Piazzi* in 1801; *Pallas*, by Dr. *Olbers*, in 1802; *Juno*, by M. *Harding*, in 1804; and *Vesta*, by Dr. *Olbers*, in 1807. These last four bodies have been occasionally called *asteroids*, they being much smaller than the other planets. The rest of the planets have been known from remote ages.

Several of the planets have moons revolving round them similar to that of the moon, which revolves around our earth. *Jupiter* has *four* moons, *Saturn seven*, and *Uranus six*.

The sun *revolves on his axis* in twenty-five days and ten hours; the revolution of *Mercury* on its axis is unknown; that of *Venus* is completed in twenty-three hours and twenty minutes; of the *Earth* in about twenty-four hours; of the *Moon* in about twenty-seven days; of *Mars* in twenty-four hours forty minutes; of *Jupiter* in about ten hours; of *Saturn* in ten hours seventeen minutes; that of *Uranus* is unknown.

The diameter of the Sun is about 883,250 miles; the diameter of the Earth is 7950 miles; which being assumed as *eight*, the diameter of Mercury will be *three*, of Venus *eight*, of Mars *four*, of Jupiter *eighty-nine*, of Saturn *seventy-nine*, and of Uranus *thirty-five* thousand miles. The distance of Mercury from the sun is about 36, of Venus 68, of the Earth 93, of Mars 142, of Jupiter 486, of Saturn 892, and of Uranas 1800 millions of miles. *Comets* have a long train of light usually called the tail; their periods of revolution are not accurately known: they are not often visible.

The *fixed stars* are infinite in number; more than 2,000 can be seen by the naked eye; but observed through a telescope, their number is prodigiously increased. It is generally supposed that each star is a sun similar to our sun, and that planets revolve round and are enlightened by it in the same way as in our solar system; but the immense distances of all the fixed stars preclude us from observing such planetary bodies if they exist.

> "Who can satiate sight
> In such a scene, in such an ocean wide
> Of deep astonishment?"—YOUNG.

Our knowledge of astronomy has been considerably extended during the last and present century; the invention of powerful telescopes, among which that of the late Dr. HERSCHELL may be particularly mentioned, has much contributed to such knowledge,—a knowledge at once interesting, instructive, and sublime.* (See TELESCOPE, forwards.)

* A small work, entitled *Guy's Elements of Astronomy*, has lately been published with numerous engravings, in which the science is rendered easy to the student's comprehension beyond any treatise that has yet appeared.

METEROLOGY, the doctrine of the phenomena of the atmosphere, or in more common language, the science of the weather deduced from accurate and extensive observation.

This science is in its infancy, although it is most certainly deserving attention, and particularly that of the agriculturist. The phenomena of the atmosphere may be arranged under five heads: the alterations which occur in the weight of the air (see forwards, BAROMETER;) those which take place in its temperature; the changes produced by rain and evaporation; the excessive agitation to which it is frequently subject; and the phenomena arising from electric and other causes.

The *wind*, which is produced chiefly by the alteration in the temperature of the air is one of the most extraordinary phenomena of meterology. It is no doubt, however, produced by other occasional causes, such are electrical agency and the decomposition of gases in the atmosphere.

When the wind moves only 1 mile in an hour, its motion is hardly perceptible;—2 or 3 miles, it is just perceptible;—4 or 5, pleasant;—10 to 15, pleasant, brisk;—30 to 35, a high wind;—40 to 45, a very high wind;—50, storm or tempest;—60, a great storm;—80, a hurricane;—and when it moves 100 miles an hour, it is a hurricane, tearing up trees and carrying buildings before it.

ELECTRICITY, as one of the phenomena of the atmosphere, may again be mentioned here; but as our limits preclude enlarging upon it, we refer to page 103, where the young student will find all that we have thought necessary to say concerning it.

GALVANISM, which seems nothing more than a modification of electricity, has also been noticed in page 104. We may add here, that the name is derived from Galvani, who first discovered it. Electricity, properly so called, is chiefly excited by friction; but galvanism is exemplified by the chemical action of bodies upon each other. The nerves and muscles of animals readily yield to galvanic stimuli. In 1791 Galvani discovered at Bologna that a dead frog may have its muscles brought into action by very small quantities of electricity. If a person place a piece of one metal, as a half crown, above, and a piece of some other metal, as zinc, below his tongue, on bringing the outer edges in contact, he will perceive a peculiar taste; upon this principle we may also conceive, that porter has a peculiar taste when drunk out of a pewter vessel. Again: if a person in a dark place put a slip of tin-foil upon the bulb of one of his eyes and a piece of silver in his mouth, by causing these to communicate, a faint flash of light will appear before his eyes.

To GALVANI, as we have stated, are due the first discoveries in this science; to VOLTA we are indebted for their explanation and application to purposes of utility; and, for the grand and simple law of nature by which galvanism operates in the production of effects, to Sir HUMPHRY DAVY.

ÆTHER or ETHER, a thin, subtile, and perfectly pure fluid. The term is, however, variously understood. With chemists it is a body formed by distillation from a mixture of alcohol and sulphuric or nitric acids; with electricians it is the electric fluid or solar light; with others it implies a fluid that fills all space in which the stars revolve, and which, when impregnated with earthy exhalations, forms the atmosphere. In this sense ether is called rarefied air; that is,

ether free from extraneous particles. But it is, at best, a vague term: it is only usefully applied to the chemical compounds.

ASTROLOGY scarcely deserves notice; but as there are those still weak enough to believe that it is possible to foretell future moral events from the aspects, positions, and influences of the heavenly bodies, in which astrology consists, we may just observe that no intelligent person puts the least faith in such pretended science; and had not the vulgar prejudices of mankind been encouraged by silly *almanacs* and other writings of that class which tend to delude the weak and credulous, long since would this species of science have gone to its everlasting repose.

While upon *visionary* subjects, we may just add here, that ALCHEMY was a visionary chemistry, by which its votaries pretended to teach the art of making gold;—a universal medicine or panacea; and a universal solvent. It is needless to say that such art consisted in gross delusion; and that long since have been demonstrated its craft, absurdity, and folly.

Connected with alchemy, were the attempts to obtain the

PHILOSOPHER'S STONE, which was said to change any of the common metals, such as tin, lead, &c. into gold. It is scarcely necessary to say that this stone has never been, and we may, without much fear of being deemed false prophets, predict that it never will be discovered.

Palmistry is a fanciful kind of divination performed by inspecting the lines and marks of the hands and fingers. It is now chiefly practised in this country by those vagrants called *gypsies;* and we wish we could say, to the credit of the *ladies*, that they are *not* in the habit of listening to such persons; sorry, however, are we to observe, that Greenwich park in the summer season is much pestered with these false prophetesses, and that respectable ladies are often seen listening to their sibylline and ridiculous predictions.

ANIMAL MAGNETISM is another of those pretended sciences with which some crafty and designing persons have deluded and imposed upon the credulous portion of mankind. It originated with HEHL, a German, who strongly recommended the use of the magnet in medicine; but the founder of the imposture was MESMER, a physician of the same country, who went to Paris, and flourished in a very extraordinary manner in the years 1778 and 1779. He asserted that "animal magnetism is a universal fluid and the medicine of natural influence between the celestial bodies and the earth and animal bodies; that by means of this fluid nervous disorders are cured", &c. &c. Although no person of decent understanding credits such pretensions, there are still, even in England, some who believe in their truth.

A similar imposture was practised in this country about the year 1800, by an American of the name of Perkins, who sold for five guineas two pieces of metal not worth a sixpence, under the name of *metallic tractors*. Perkins realized a considerable sum of money; but he did not live long, and his tractors soon sank into neglect, as every thing that is not both useful and true, sooner or later, invariably does.

CHRONOLOGY, HISTORY, BIOGRAPHY, ETC.

CHRONOLOGY teaches us to assign past transactions to their proper times. To be well acquainted with this branch of knowledge is of considerable importance to the young student Astronomy and Chronology are intimately connected : to astronomy we owe the regular division of time—the true measure of the year. The uncertain accounts of time, among the ancient Greeks and Romans, arose chiefly from their confused notions of the *solar* and *lunar* year. To make any regular progress in learning, some knowledge of chronology is indispensable. To read history without it, is like sending a ship to traverse the ocean without a rudder or a compass.

Chronology may be conveniently divided into three sections ; the time before the *Flood*, which happened, by the most approved account, 2348 years before the birth of Christ ; the time from the flood to the birth of Christ ; and the period from the birth of Christ to the present time, 1829*.

The world, according to the Mosaic account, was created 4004 years before the birth of Christ ; of the transactions between the creation and the flood we know nothing, except from the Scripture. And of many of those which occurred after the flood and before the birth of Christ we know nothing with certainty, except from the same source ; but about 1000 years before the birth of Christ profane writers arose : from many of the historians of Greece and Rome numerous facts in chronology may be obtained. In judging of ancient writings it should never be forgotten that as all books previously to the discovery of the art of printing were in *manuscript*, their number of copies were necessarily limited ; the ease therefore with which errors of every kind might be foisted into, or even by accident occur, in such manuscripts must be sufficiently apparent. In judging of chronology, and in fact of history generally, the careful student should keep these impressions constantly in his mind ; comparing the statements of many writers, and drawing conclusions from the greatest number of probable facts. These observations necessarily lead us to a notice of

HISTORY, which is a record of such past transactions as are deemed of sufficient importance to be known to posterity. History has been sometimes defined philosophy teaching by example ; and most true it is, that whether all history be philosophy or not, it is, next to the immediate actions of which we are personal witnesses, the most important teacher to whom we can appeal. No one therefore, who desires to become acquainted with the manner in which the great, the good, and the distinguished have acted, ought to be ignorant of history. The only condition in its study is that we should take care to read only those historians of whose veracity we see no reason to doubt. A corrupt historian, a falsifier of facts, is a pest in human society, and should be avoided.

ANTIQUARY is a person who searches after remains of antiquity, monuments, medals, coins, books, statues, sculpture, and inscriptions. A good antiquary ought to be a good historian, at least of

* A chronological *Chart of General History* has been re-published by the compiler of this work, which, it is presumed, will be acceptable to every student and an acquisition to every library.

the history of what he particularly pursues. A study of antiquities has, no doubt, its uses; but it is necessary that we should be guided by reason in our antiquarian researches; an antiquarian will sometimes set an inordinate value on things of no importance; witness the fact that above *two thousand pounds* were given in this country, some time since, for a book, a copy of the *Decameron of Boccacio*, which, for all useful purposes, might have been and now may be purchased for a few shillings.

BIOGRAPHY may be defined an *individual*, as *history* may be termed a *general*, account of past transactions; it has been usually called the art of describing or writing lives. It is, in many respects, more useful and often more entertaining than general history. Who is there that does not desire to become acquainted with the habits, manners, and modes of life of such men as Socrates, Plato, and Demosthenes; of Cicero, Cato, Virgil, and Horace; or, to approach nearer our own times, of Chaucer, Shakspeare, and Milton; of Bacon and Locke; of Dryden and Pope; of Thomson and Cowper; of Nelson and Voltaire; of Lord Byron and Walter Scott; of Washington and Napoleon Buonaparte? A contemplation of the lives of such eminent men must be always replete with instruction; even the gossip in Boswell's Life of Dr. Johnson is not without its use.

PHILOLOGY is a very vague term. By some persons it has been considered *universal literature;* but it is more commonly confined to *criticism and language;* the term in fact implies a *love* or *the study of languages.* This branch of knowledge is what the French call the *Belles Lettres*, but these terms include many more sciences than those, of criticism and language. In the universities it is called *Humanitas* or *humaniories literæ.* We have before spoken of language and grammar, (see pages 296, 7;) of *criticism* we may remark that it does not consist in merely finding faults in a literary production: an intelligent critic ought, in examining a work, to point out, of course, its defects, but it is not less his duty to exhibit its excellences, if it possess any; and, if he be actuated by a proper spirit, he will show in what way such a work might be improved.

Mathematics, Algebra, Geometry, etc.

MATHEMATICS, the science which considers magnitudes either as computable or measurable. The word (*in Greek*) signifies discipline or science in general, and is said to have been applied to the *doctrine of quantity* by way of eminence. Such is the use and excellence of mathematical knowledge, that the exact sciences, such as *architecture*, *optics*, *perspective*, *geography*, *astronomy*, *hydrostatics*, *geometry*, &c. &c. are necessarily connected with it, and greatly depend upon its numerous laws and deductions. In short, whether we view mathematics, in their application to the noble works of art, or in the assistance which they render us in making us acquainted with the laws of motion and those of the phenomena of the universe in particular; their study is every way desirable, and ought to be encouraged; at the same time we ought never to forget that *utility* should be the chief object of such pursuits: to sacrifice wholly to mathematics would not be more wise than it would be to consider eating and drinking the end and not the means of life. Some of the sciences more immediately connected with mathematics are the fol-

lowing: (of *architecture*, *geography* and *astronomy* we have already treated:)

ALGEBRA, a method of computation in which signs and symbols, commonly the letters of the alphabet, are made use of to represent numbers, or any other quantities. Properly speaking, this science is a kind of short hand or ready way of writing down a chain of mathematical reasoning on any subject whatever. It is applicable to arithmetic, geometry, astronomy, &c. The conciseness and perspicuity with which every proportion can be written down in algebraic characters, render it greatly superior to the circumlocution of words and figures. Algebra is divided into two parts, *numeral* and *literal*, or specious; the former is the algebra of the ancients, where unknown or required quantities only are represented by letters or charaeters, the known ones by numbers. The latter, sometimes called *new algebra*, is much more extensive, the known as well as unknown quantities being expressed by letters. The process in both methods is, however, essentially the same. *Known* quantities are expressed by the letters a, b, c, &c.; *unknown* quantities by x, y, z, &c. This mark $+$ signifies *addition*, and is named *plus;* this mark $-$ *subtraction*, and is named *minus;* this mark $\times$ *multiplication*, and is named *into;* this mark $\div$ *division*, and is named *by;* this mark $=$ is the symbol of equality; this mark $\surd$ denotes the square root; with a 3 before it thus, $\sqrt[3]{}$, the *cube* root; with a 4 before it, the fourth or *biquadrate* root.

Proportion is denoted as follows: thus, if a be to b as c to d, it is stated in this way, $a : b :: c : d$, that is, as a is to b so is c to d. Again, $x = a - b + c$, is an equation shewing that x is equal to the difference of a and b, added to the quantity c.

We cannot proceed further in our exemplification of algebraical signs; the reader who desires more information will of course consult some treatise on this subject.

GEOMETRY literally implies the *admeasurement of the earth*, but it commonly means that science which treats of *lines*, *surfaces*, and *solids*, and is the doctrine of extension and magnitude in general; hence *lines*, *angles*, *circles*, and, in short, *figures of every size* and *shape* are the subjects of geometry. A body which has *length* and *breadth* only, is termed a *superficies;* such is a board, a table, a field, &c. That which has *length*, *breadth*, and *thickness*, or *depth*, is termed a *solid*.

Geometry, like other useful inventions, appears to have been the offspring of want and necessity, and to have originated, in remote ages, far beyond the reach of history. Egypt, the fruitful mother of

many sciences, is presumed, however, to have given birth to geometry and mensuration. It is said, that we are indebted to the inundations of the Nile for this branch of knowledge: as, when that river had deluged the country, all artificial land-marks of property being destroyed, there was no other method of ascertaining individual property but by a previous knowledge of its figure and dimensions. Whether this be correct or not, there can be no doubt that the Egyptians were early acquainted with the principles of the science, as the numerous buildings still extant in that country decidedly evince. In confirmation of this, we may also state that Euclid, a famous mathematician of Alexandria, where we presume he was born, has immortalized his name by his work called the *Elements of Geometry*, and which is, at the present time, used as a class book in most, if not all, of our Universities. He flourished 300 years before the Christian era, and had even Ptolemy, the king of Egypt, for one of his pupils. Indeed it is said that Alexandria continued for ages the great university for mathematicians.

Of the uses of geometry it is scarcely necessary to speak; to artificers, and every one concerned in the construction of edifices, the admeasurement of superficies and solids, it is invaluable. But it should be stated, that although Euclid furnishes us with the elements of the science, their practical application must be acquired from other sources. Till lately, no regular treatise on this subject was to be obtained in the English language. *Dr. Hutton* has, however, treated it in a scientific and methodical manner; we have now also many other treatises on geometry. Plato testified to the importance of this science by inscribing on the door of his academy,—"*Let no one ignorant of geometry enter here.*"

TRIGONOMETRY, that part of geometry which teaches the art of measuring the sides and angles of triangles, either plane or spherical, whence it is called either *plain* or *spherical* trigonometry.

In *plane* trigonometry the right lines that form the triangle are supposed to be divided into some assigned number of equal parts. These lines are denominated sines, targents, secants. The *sides* may be estimated in feet, yards, chains, or by any other definite measure or abstract numbers; but the *angles* are measured by the areas of a circle contained between the two legs (or lines), having the angular point for its centre. Every circle is supposed to be divided into 360 equal parts, called *degrees;* each degree into 60 equal parts, called minutes. An angle is said to be of as many degrees, minutes, &c. as are contained in the arc or part of the circumference by which it is measured. Thus, a right angle is a fourth part of the whole circle or 90 degrees; an *obtuse* angle is greater than 90°; an *acute* angle less than 90°.

Upon the principles of trigonometry innumerable calculations are formed both respecting the heavens and the earth: for as in every triangle are three sides and three angles, so, by having one of each given, all the others may be found.

LOGARITHMS, the indices of the ratios of numbers one to another, or a series of artificial numbers proceeding in arithmetical proportion corresponding to as many others proceeding in geometrical proportion; and contrived for the ease and expedition of calculation. The writers on logarithms are numerous; but *John Napier*,

Baron of Merchiston, was their inventor. His *Logarithmorum Canonis Descriptio* was published in 1614.

FLUXIONS. We have not seen any definition of fluxions as part of the science of mathematics, which is at once simple and intelligible to the uninitiated in this, as it is said, sublime portion of the science. A *fluxion* has, however, been defined as denoting the velocity with which a flowing quantity is increased by its generative motion: by which it stands contradistinguished from fluent or the flowing quantity, which is gradually and indefinitely increasing after the manner of a space which a body in motion describes. Fluxions were discovered, it is said, both by Sir Isaac Newton and Leibnitz; the palm of priority is generally awarded to Newton. The discovery of Fluxions is said to be one of the greatest and most sublime discoveries of any age. A treatise on this subject, written by Dr. Henry Clarke, has been particularly recommended.

ARITHMETIC, the science of numbers, or that part of mathematics which treats of their powers and properties, and teaches how to calculate truly and with ease and expedition. The utility of arithmetic is so very great and important in the every day transactions of life, that to be ignorant of it argues no ordinary neglect. The four most important parts of arithmetic are those called *addition*, *subtraction*, *multiplication*, and *division*: for however complicated soever might be other parts of this science, one or other of these will be in some way mixed up with them. Arithmetic consists, however, of various parts, besides what are usually called *common*: such are *decimals*, *duodecimals*, *vulgar fractions*, &c.; the *extraction of the square and cube roots*, and many other sections. In addition to the knowledge of *common* arithmetic, a knowledge of *decimal fractions* should never, in any education, be omitted. In many instances of admeasurement decimals will be found the most easy and expeditious method of obtaining results. In our present work the student, who is not acquainted with decimals, will be at a loss to know the exact weight of many bodies, as it is the practice of chemists and others invariably to state specific gravities in decimal fractions. See *Specific Gravity*, page 310.

NAVIGATION, the art of conducting a ship on the sea and from one place to another. It includes not only the mechanical management of the sails and the working of the ship, which must be acquired on shipboard and in the practice of sailing, but also the theory, which is to be obtained from tables of latitudes and longitudes, maps and charts, various instruments and a stock of mathematical learning, particularly trigonometry. One of the most useful practical treatises on navigation was published, a few years since, by Mr. RIDDLE, master of the mathematical school at the Royal Naval Asylum, Greenwich.

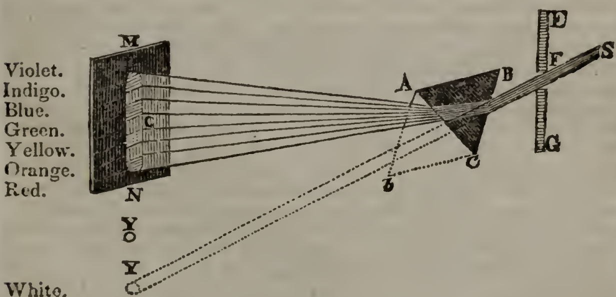
OPTICS, the science which treats of vision, and generally of the nature and properties of light. It is the province of optics to show why objects appear greater or smaller, distinct or confused, near or more remote. All rules of perspective have their foundation in optics. The ancients formed conjectures in this science without foundation; it was reserved for the sagacious NEWTON to discover the nature of light so far at least as to be able to resolve its rays into *seven* distinct portions in the following manner: see the figure.

In the window shutter, E G, of a dark room he made a hole, F, about one-third of an inch broad, and he placed behind it a glass prism,

A B C, so that the beam of the sun's light, S F, might enter and leave the prism at equal angles.

Before the interposition of the prism, the beam S F proceeded in a straight line to Y, where it formed a round white spot; but being now refracted by the prism, it will form upon the screen, M N, an oblong image, containing seven colours as enumerated in the figure, the *red* being *least*, and the *violet* most refracted from the original direction, S Y, of the solar beam. This oblong image is called the *solar*, and sometimes the *prismatic spectrum.* By making a hole in the screen, M N, opposite any one of these colours, so as to allow it to pass; and by letting the colour thus separated fall upon a second prism, Sir Isaac found that the light of each of the colours was alike refrangible, because the second prism could not separate them into an oblong image or into any other colour. Hence he called all the seven colours *simple* or *homogeneous*, in opposition to *white* light, which he called *compound* or *heterogeneous.* With the prism used by Sir Isaac, he found the lengths of the colours and spaces to be as follow:—red, 45; orange, 27; yellow, 40; green, 60; blue, 60; indigo, 48; violet, 80: or 360 in all.

Having thus decomposed white light into seven primary colours, he next shewed that the same colours, when again put together or combined, recomposed white light. This may be proved rudely, by mixing together seven different powders, having the colours and proportions as above stated; or, what is better, by painting the rim of a wheel with the seven prismatic colours, and making it revolve rapidly round on its axis. In both cases the mixture of the colours will be a greyish white, because no colours can be obtained of the delicate tints which the rays of light have.



* Of parent colours first the flaming *red*
Sprung vivid forth; the tawny *orange* next;
And next delicious *yellow;* by whose side
Fell the kind beams of all-refreshing *green;*
Then the pure *blue*, that swells autumnal skies,
Ethereal play'd; and then of sadder hue
Emerg'd the deepen'd *indigo*, as when
The heavy skirted evening droops with frost;

While the last gleamings of refracted light
Died in the fainting *violet* away.

BLACKMORE.

Those who desire further information concerning this curious and interesting subject may consult the *Library of Useful Knowledge*, Nos. 12, 13, 19, and 21. (See TELESCOPE, &c.)

PERSPECTIVE is that branch of optics which teaches how to represent objects on a plane surface, exactly as they appear in nature. It is the art of drawing, according to the principles of geometry, the true representation of real objects. If we view a print placed beyond an upright transparent plane, as a glass window, the spot where a straight line from the eye to this point will go through the window, is the perspective representation of it; for the eye views all objects by means of rays of light, which proceed from it to the different points of the object in straight lines.

Suppose, then, a spectator within doors is looking through a glass window at a prospect without. If he could keep his eye perfectly steady to one point, and with a fine camel hair pencil passing between his eye and the objects without, whether buildings, trees, animals, &c., they would be all represented in true perspective. These objects will be found to diminish in size, in proportion to the distance from which they are seen, and the whole will accord with certain known mathematical principles, laid down in treatises on perspective.

ACOUSTICS or PHONICS, the doctrine or theory of sounds or hearing. Some writers call the science of sounds coming directly to the ear from the sounding body *diacoustics*, and reflected sounds *catacoustics*.

This science is analogous to optics, and is divided into direct, refracted, and reflected sound; which may be improved with regard to the object, the medium, and the organ. The first in speaking, in whistling, singing, &c., which are all distinct arts and all improvable; secondly, by the position of the sonorous body. Sound may also be improved by the thinness of the medium, and by the sonorous body being placed near a smooth wall, either plain or arched; hence the theory of whispering places. Again, by placing the sonorous body near water, its sound is mollified; by placing it on a plain it is conveyed to a greater distance than on uneven ground. As to the organ the *ear*, it is assisted by being placed near a wall, especially at one end of an arch, the sound beginning at the other; or near the surface of water or the earth; or by instruments, as the *speaking trumpet;* by a *microphone*, or magnifying ear instrument; or by a *polyphone*, or multiplying ear instrument.

The usual medium of sound is air; in a receiver exhausted of air a bell can scarcely be heard at all. Sound is heard at a greater distance when carried with the wind or a current of air, than when passing in opposition to it. It is now generally assumed that sound passes through 1142 feet of air in a second of time, 13 miles in a minute; distances may therefore be calculated by sound with some approach to accuracy.

Acoustics in medicine are those instruments or drugs which assist the hearing.

MECHANICS, a mixed mathematical science which treats of motion and moving powers, their nature and laws, with the effect

thereof on machines. Whatever communicates, or tends to communicate motion to a body is called a *force*. The object of mechanics, in the most extended sense of that term, is the investigation of the effects of forces on bodies.

The mechanical powers are the *balance*, the *lever*, the *wheel*, the *pully*, the *wedge*, and the *screw*.

The science of mechanics consists of two parts, namely; STATICS, in which bodies are considered as submitted to the influence of forces which are in equilibrium, and DYNAMICS, in which bodies are considered as submitted to the action of forces which are not in equilibrium. In the former, therefore, bodies are considered at rest, and in the latter as in motion. The science of mechanics as a popular study is, however, usually treated in a different way. The treatises which have been published by the Society for the Diffusion of Useful Knowledge, treat of mechanics under the following heads. *On the mechanical Agents or Prime Movers; Elements of Machinery; on Friction and the Rigidity of Cordage; Animal mechanics or proofs of Design in the animal frame.* The edition of Ferguson's "Mechanics" by Dr. Brewster, and Dr. Olinthus Gregory's "Mechanics" are well worthy the attention of the mathematical student. *Ray on the Creation*, and *Paley's Natural Theology*, are also well deserving the attention of the student of animal mechanism.

HYDROSTATICS, the science of gravitation in fluids; or that part of mechanics which treats of the weight of fluid bodies, particularly water; and also of solid bodies immersed in them. The oldest writers on this subject are Archimedes and Botour; modern writers have treated the science more amply; among whom Sir Isaac Newton and Canton may be mentioned; this last has, it is said, demonstrated the compressibility of water. See *Specific Gravity*, page 310.

HYDRAULICS literally imply the science of the motion of water through pipes; but it now comprehends the science of the motion of liquids universally, the laws of such motion, the effect of moving liquids upon bodies in them either at motion or at rest; in the language of modern mathematicians, it is considered as synonymous with HYDRODYNAMICS, which have been defined that science which treats of the power of water, whether it acts by pressure or impulse.

Pumps, steam-engines, fountains, and a variety of useful contrivances, are all more or less dependent on hydraulics.

The foundation of hydraulics is that principle of fluids which distinguishes them so remarkably from solid bodies; namely, that if conducted by pipes or other medium they always rise to the level, or nearly so, of the reservoir whence they are supplied. Thus, water is conveyed to the upper stories of houses, and artificial fountains are made.

TACTICS, the art of disposing forces in form of battle, and performing military motions and evolutions. The Greeks were, it is said, very skilful in this art, having public professors named *tactici*. The Romans may, however, be considered the first nation whose military array could be termed regular. *Tactics* are also used in a

28*

more extensive signification than the preceding definition implies; the art of inventing and making machines for throwing darts, arrows, stones, fire-balls, &c., by means of bows, slings, &c., is sometimes included in it; there are also *naval* (as well as military tactics,) which instruct us in the arrangement of a fleet for engagement.

GUNNERY, the art of charging, directing, and exploding fire-arms, as cannon, mortars, muskets, &c., to the best advantage. It is of course a part of the military art, but it partakes also of *pyrotechny*. Some parts of gunnery are brought under mathematical consideration; such are the rules and the method of computing the range, elevation, quantity of powder, &c., so as to hit a mark or object proposed; this is however more particularly called *projectiles*.

FORTIFICATION or MILITARY ARCHITECTURE, is the art of fortifying a place by making works around it, so that it may be defended, by a small force, against the attacks of a numerous enemy. This, like gunnery and tactics, is a branch of necessary study for those military and naval officers who would be distinguished by their talents and abilities.

THE MANAGE AND VETERINARY SCIENCE.

The MANAGE or MENAGE, is a term adopted from the French, and signifies, among many other things, the government or management of a horse; it is, however, not only used in this sense, but also implies a consideration of horses, their age, colour, paces, diseases; in short, of every thing that has relation to their nature and use. Manage also implies an academy, riding-school, or other place for learning to ride the horse, to break him into his proper paces, &c. Connected with this subject is the

VETERINARY SCIENCE, or FARRIERY, the knowledge of curing the diseases of not only horses, but of cattle of all kinds. Till the year 1792, this science, as a science, was unknown; and the art of curing the diseases of animals was confined to the most ignorant empirics; but since the establishment of the VETERINARY COLLEGE, at St. Pancras, near London, it has undergone considerable improvement. Many young men have become pupils of that academy, and are now dispersed through various parts of the country as *veterinary surgeons;* yet it is to be feared that the number of ignorant pretenders is yet, compared with the truly scientific, lamentably great.

POLITICS, POLITICAL ECONOMY, STATISTICS.

POLITICS, the science of government; in a more familiar sense, the art or practice of administering public affairs. On this subject, what is said under the head SOCIETY, &c. p. 242, will be sufficient for our purpose; an important branch, however, of politics, called,

POLITICAL ECONOMY will here demand some notice; a science which has latterly excited more than ordinary attention, and one too with which every one ought to become acquainted: it is usually defined, that science which treats of the wealth of nations.

Many writers on political economy have, during the last twenty years, considerably excited the public attention; one of the first of these is Mr. *Malthus*, who has put forth some extraordinary propositions, and established them, or attempted to establish them, with no ordinary skill and talent. The sum of Mr. Malthus's doctrines consists in this, the *population* of a country increases, or has a tendency to increase in *geometrical*, *subsistence* only in an *arithmetical* ratio; and that therefore, as population is constantly pressing against the means of subsistence, misery, vice, and crime, are the results; and he proposes, as one of the principal remedies of such evils, that the increase in population should be restrained by law. Mr. Mill and Mr. Macculloch have also advocated the doctrines of Mr. Malthus, as well as several of the leading Reviews; but there is, nevertheless, a large body of intelligent persons in this country, who do not admit the truth of Mr. Malthus's propositions, nor the correctness of his deductions from them. We think, indeed, that they are very questionable: for while no one can doubt that considerable misery prevails in certain classes of society, we are disposed to think that this arises, at least in this country, rather from the *unequal* distribution of wealth, than from its actual deficiency. Nor do we think that the doctrines of Mr. Malthus are calculated to remedy the evils of which he complains; they appear to have, besides, in them so much inhumanity, and to incite to inhumanity, that, as advocates for that charity inculcated by the Founder of Christianity, we cordially hope our young readers may not be led away by, what we cannot avoid considering as, sophisms decidedly detrimental to the happiness of a large portion of our fellow men. The remedies for the evils complained of by many of our political economists, appear to us to lie chiefly in *the active exercise of the benevolent affections.* In enforcing this, we are sure that we can do no wrong—all benevolence must tend to good: *the greatest of all the virtues is charity.* We may just add, that Adam Smith, a writer of the last century, drew much attention to this subject, by his treatise on the *Wealth of Nations;* and that the works of many other writers, besides those above-named, are deserving perusal, among which those of Mr. Godwin and Mr. Thomson may be mentioned.

STATISTICS, that science which treats of the extent and population of a state, the occupation of its inhabitants, the progress of agriculture, of manufactures, of internal and foreign trade, the income and wealth of the inhabitants, the taxes, the poor, the schools, with every other subject that tends to promote the civil policy, and consequently the prosperity of a country. In point of fact, there is very little difference between this science and political economy; they both treat of the same objects, and ought to have the same end in view; namely, the most effectual promotion of human happiness.

Various writers have published statistical accounts. Among whom Sir William Petty, Arthur Young, and Sir John Sinclair may be named. The latest which have appeared are those by Mr. W. Cowling, Civil Engineer, with which he furnished, a short

time since, the Emigration Committee of the House of Commons. The following is the summary

Statement of the Territorial Surface of Great Britain and Ireland.

Territorial Divisions.	Arable Lands and Gardens.	Meadows, Pastures, and Marshes.	Uncultivated wastes capable of improvement.	Surface incapable of any Improvement	Summary of each Territorial Division.
England.	10,252,800	15,379,200	3,454,000	3,256,400	32,342,400
Wales.	890,570	2,226,430	530,000	1,105,000	4,752,000
Scotland.	2,493,950	2,771,050	5,950,000	8,523,930	19,738,930
Ireland.	5,389,040	6,736,240	4,900,000	2,416,664	19,441,944
British Islands.	109,630	274,060	166,000	569,469	1,119,159
Statute Acres.	19,135,990	27,386,980	15,000,000	15,871,463	77,394,433

According to this statement, there is yet no lack of land for the ample employment of our superabundant population.

Connected with this subject is the

POPULATION, which implies the whole number of the people of any state or place.

The POPULATION OF THE EARTH by the most recent and respectable authorities is as follows:

	Inhabitants.
Europe	209,862,000
Asia	482,345,500
Africa	106,383,100
America	36,593,400
Australasia	2,628,000
Total	837,812,000

This after all is but a *probable* amount. Some persons rate the population of the earth as high as 1000,000,000.

The POPULATION OF GREAT BRITAIN was long a subject of great uncertainty; but the enumeration of the people, according to acts of parliament in the years 1801, 1811, and 1821 respectively, has removed, in a great measure, the doubts which heretofore existed on the subject. These returns have demonstrated, that the population of these kingdoms is gradually on the increase; London and some of our large manufacturing and commercial towns, such are Glasgow, Leeds, Liverpool, Manchester, Birmingham, Bristol, Norwich, Ply-

mouth, &c. particularly so. The following is *a Summary of the Population of the United Kingdom* at the periods mentioned.

Number of Persons in—	1801	1811.	1821.
England	8,331,434	9,538,827	11,260,555
Wales, ...	541,546	611,788	717,108
Scotland	1,599,068	1,808,688	2,092,014
	10,472,048	11,959,303	14,069,677
Army and Navy . . .	470,598	640,500	310,000
Total of Great Britain .	10,942,646	12,599,803	14,379,677
Ireland			6,846,949
Grand total of the population of Great Britain and Ireland in 1821			21,226,626
The population of the Isle of Man, Guernsey, its dependent Isles, Jersey and Scilly, was together in 1821			92,125

BILLS OF MORTALITY are the weekly lists compiled by the parish clerks in and about London, containing the numbers of those who die, and specifying of what disease, as well as those that are born in every week. These bills are founded upon the reports of sworn searchers, who view the body after the decease, and deliver their reports to the clerks. The bills of mortality were first begun to be taken by the company of parish clerks in London in the year 1592; and in 1594 the weekly account was first made public. In 1595 they were discontinued upon the ceasing of the plague; but in 1603 they were resumed, and have been continued regularly ever since. The original bills comprehended only 109 parishes, but others have been from time to time added to them, so that they now (1829) comprehend 153 parishes, of which 97 are within the walls, 17 without the walls, 29 are out-parishes in Middlesex and Surrey, and 10 parishes are in the city and liberties of Westminster.

From the 13th of December 1827, to the 12th of December 1828, one year, the general bill of christenings and burials was for those 153 parishes as follows:—

Christened	Males	13,360	In all 26,545.
	Females	13,185	
Buried	Males	11,112	In all 21,709.
	Females	10,597	

Excess of Christenings over Burials for the year 1828, 4836.

The CHIEF CITIES and TOWNS of the British Empire, as regards their population, are the following:—

LONDON, the metropolis, distinguished by some of the most superb buildings and streets in the world, contained, in 1821, with its dependencies 1,225,694 inhabitants*. But it should not be forgotten that,

* This number includes not only all the inhabitants contained in the parishes within the bills of mortality, but also the population of other parishes not within those bills, containing (in 1821) 224, 300 inhabitants.

in estimating the population of London, the *emigration* from various places forms no inconsiderable addition to it, and that, therefore, the *births* as above stated are not an exact criterion of its increase: for it unquestionably increases in a much greater ratio than those births indicate. In 1700 London contained about an eighth part of the inhabitants of England and Wales: in 1750 above a tenth: and at present (1829) less than this proportion. The mortality of the metropolis in 1700 was one in 25; in 1750 one in 21; in 1801 and the four preceding years one in 35; and since that, not more than one in 38: thus demonstrating the improved salubrity of London; a circumstance to be expected from the extension of the population over a much larger space than formerly, the progress of vaccination, and the consequent decrease in deaths by small pox.

Number of Inhabitants in 1821, *in*

Manchester, Salford, &c.	149,756	Brighton	24, 429
Liverpool	142,141	Chatham and Rochester	24,063
Birmingham, &c.	106,722	Exeter	23,479
Bristol, Clifton, &c.	87,779	Coventry	21,242
Leeds	83,796	York City	20,787
Plymouth, Devonport, &c.	61,212	Chester, City of,	19,949
Norwich	50,288	Dublin	227,335
Newcastle-upon-Tyne with Gateshead	46,948	Cork	100,658
Portsmouth and Portsea	45,648	Limerick	59,045
Hull	44,924	Belfast	37,277
Sheffield	42,157	Waterford	28,679
Deptford and Greenwich	40,574	Galway	27,775
Nottingham	40,415	Kilkenny	23,230
Bath	36,811	Edinburgh	138,235
Leicester	30,125	Glasgow	147,043
		Paisley, &c.	47,003
		Aberdeen, Old, New	44,796
		Dundee	30,575
		Grenock	22,086

The Fine Arts.

We have defined the difference between the *fine* and *mechanical* arts, at the commencement of this portion of our work; we shall therefore, without further preface, proceed to the consideration of the most important branches of this section: of *Architecture* we have already treated in page 297.

DRAWING consists in justly representing the appearances of objects upon paper, or on any plain surface, by means of lines and shades, formed with certain colouring materials adapted to the purpose; such materials are usually *common ink*, *Indian ink*, and *black lead pencils;* these last are now made of different shades of black, so as to produce an agreeable variety in such colouring; besides these, are occasionally used in drawing, *crayons of black*, *white*, or *red chalk*, *crow-quill pens*, a *ruler* and *compasses*, and *camel's hair pencils.*

Having all these implements in readiness, the first practice of the student must be to draw straight and curved lines with ease and freedom, upwards, downwards, sidewise, to the right or left, or in any other direction. He must also learn to draw accurately, by command of hand only, squares, circles, ovals and other geometrical figures. The practice of drawing these simple figures, till he is master of them, will enable him to imitate, with ease and accuracy, many appearances both of nature and art. He should also take care in his drawing never to hurry, but to make himself perfectly master of one figure before he proceeds to another; he should also draw all his figures large, by which he will acquire a free and bold manner of designing; and he should, besides, practise these outlines, till he has gained a tolerable command of his pencil, before he attempts to shadow any figure or object whatever.

In proceeding to draw the *human body*, he ought to know that there are certain *proportions* and *measures* to which he must attend, such are *the length of the head and trunk, of the fore-arm, and upper extremities, of the lower extremities*, &c. &c. These have been usually given in reference to the statues called the *Apollo Belvidere* and the *Venus de Medici*, which are considered as the most perfect exemplifications of the *male* and *female* appearance of the human form. Hence some knowledge of anatomy in practising this and the sister art is absolutely necessary. Next to these are to be considered, *the different attitudes of the human figure; the effects of the exertions of the muscles; the distribution of light and shade; of drapery; the effects of the passions, &c.*

Hence the student may proceed to draw *flowers, fruit, birds, &c.* Very few rules are here requisite; good prints or drawings, by way of examples, may be copied with great care and exactness; and in the absence of these, the *natural* objects themselves, furnish an inexhaustible fund of the best kind, whence good drawings may be made.

Landscapes, Buildings, &c., may also be now delineated; and as this is a portion of drawing in which many persons may be peculiarly interested, uncommon attention should be paid to it: to be able on the spot to take the sketch of a builing or a beautiful prospect; to delineate any curious production of art, or uncommon appearance in nature, is not only a very desirable accomplishment, but an agreeable amusement.

In conclusion, we may observe, that drawing consists chiefly in nicely measuring the distances of each part of the piece with the eye; hence the rules of Perspective, (see page 328,) must be necessarily consulted.

The treatises on drawing are numerous; he who desires further information on the subject will, of course, consult them.

PAINTING is the art of representing natural and other objects, and giving to them the appearance of life and reality, by lines and various shades of colouring. Painting is said to have originated with the Egyptians; the Greeks, who learned it from them, carried it to perfection; if credit be given to what is related of *Apelles, Zeuxis*, and *Parrhasius*, painters who lived long before the Christian era. The Romans were not without considerable masters in this art, in the latter times of the Republic, and under the first emperors, but the inundations of barbarians, who ruined Italy, proved also fatal to painting. It was in Italy, however, many centuries afterwards, that

the art assumed its ancient dignity, when Cimabue, in the thirteenth century, betaking himself to the pencil, transferred the poor remains of the art, from a Greek painting or two, into his own country. To him succeeded, in the fifteenth century, some Florentines, among whom were *Ghirlandaio, Michael Angelo's* master; *Pietro Perugino, Raphael's* master; and *Andrea Verrocchio, Leonardo da Vinci's* master: the scholars, however, not only surpassed their masters, and all which had gone before them, but they carried painting to a pitch which, according to the opinion of many persons, has never since been equalled. It was not merely by their works that they advanced painting; but also by the number of pupils which they bred up, and by the schools which they formed: for the *School of Florence* was founded by *Angelo;* that of *Rome*, by *Raphael;* and that of *Milan*, by *Leonardo;* to which must be added the *Lombard School*, established about the same time, and eminent under *Giorgone* and *Titian*.

Besides the Italian masters, many eminent for their talents sprang up in other parts of Europe: *Albert Durer*, in *Germany; Holbein*, in *Switzerland; Lucas* and *Rubens*, in *Holland*, and others in France and Flanders. But Italy, and especially Rome, was the place in which the art was practised with the most success. To *Raphael's* school succeeded that of *Carrachio*. The French painters, afterwards, by the munificence of Louis XIV., attained also some distinction.

England has latterly also excelled in this art; and the establishment of the *Royal Academy of Painting*, in 1768, and the *annual exhibitions* at their rooms at Somerset House, have excited and improved the public taste for painting in this country. The names of Sir *Joshua Reynolds* and Mr. *West*, the presidents of that academy, and of Sir *Thomas Lawrence*, the present president, will ever be distinguished in the annals of painting. Of Mr. *West's* works, such as *Death on the Pale Horse, Christ Rejected, &c. &c.*, it may be said that they will remain a splendid monument of the taste and talent of that accomplished painter.

Painting is of various kinds, with regard to the materials which are used, hence we have *painting in oil*, in *water-colours*, or *limning;* in *fresco*, on *glass*, in *enamel*, and in *miniature*.

Painting in oil was unknown to the ancients. It is said that *John Van Eych*, or *John* of *Bruges* was the first who adopted this method, in the beginning of the fourteenth century; and it is supposed that all painters before his time wrought in fresco, or water-colours; but from the alterations made some time since in St. Stephen's chapel at Westminster, it is probable that oil painting was practised in England as early as the twelfth, or the beginning of the thirteenth century. The chief thing in oil painting is that of preparing the colours in nut-oil or lintseed oil; the manner of working is, however, very different from that of fresco, or water colours, because the oil does not dry so fast, and hence the painter can touch and retouch all the parts of his figures as often as he pleases; in the other kinds this is impracticable. The figures too, in this kind of painting, have more relief, and hence are rendered more exact fac similes of that which they are intended to represent.

Fresco is performed on fresh plaster, on a wall covered with mortar not yet dry, and with water-colours. This kind of painting incor-

porates with the mortar, and drying along with it, is rendered extremely durable, and never fails or falls till the mortar decays.

As in drawing, so in painting, the student ought to imitate the best models, and those models are the best which approach the nearest to *nature* herself; but, although models are extremely convenient, yet the young artist ought never for a moment to forget, that the best store-house of models is that which nature herself furnishes in every department of his art, whether it be *animate* or *inanimate*,—the human countenance, or the figures of animals, landscapes, mountains, woods, trees, the sea, and all the myriads of objects with which we are constantly surrounded.

PAINTING IN CRAYONS. *Crayon* is the French name for a *pencil*. It is a solid substance, natural or artificial, adapted for making marks on paper or other materials; crayons are fashioned into a convenient shape for use, and are of various colours. They were first called *chalks*, from the well known substance *chalk*, itself a white crayon, and which serves as a basis for many other colours. In painting with crayons the artist should be aware that colours used in a dry state have a much greater warmth of complexion than those used in a wet one; in order, therefore, to produce a rich picture in crayons, a much greater proportion of cooling tints must be applied than in oil painting. To the neglect of this many oil painters have attempted crayons without success; it may also be suspected that crayon painters are apt to introduce such tints too abundantly in oil painting; hence the errors of both.

CARTOON, from *carta*, paper, and *oni*, large (Italian); a design drawn upon large sheets of paper for the purpose of being traced upon any other substance when the subject is finished. The most famous cartoons are those of Raphael, seven of which, after having lain in the store rooms of a tapestry manufactory in Flanders, from the time of Leo X. and suffered various rough usage, were purchased by Charles I. of England, and were for a long time at Hampton Court, but are now in Windsor Castle. They consist of various scripture subjects; they have been represented as "the glory of England, and the envy of all other polite nations."

RELIEVO or RELIEF in painting is the degree of boldness with which the figures seem, at due distance, to stand out from the ground of the painting. In this one of the chief arts of the painter consists; when the light is so disposed as to make the nearest parts of the figure advance, yet insensibly diminishing and terminating in shadow brought off insensibly, the relievo is said to be bold, and the *chiaroscuro* or *clair-obscure* well understood. We may just add that these last terms imply, the effect produced in painting or drawing by an artful conduct and union of colours, and of light and shade.

For a detail of the colours, &c. proper for painting, we conclude that the student will consult treatises professedly written on the subject. See also our head COLOURS and PAINTS, page 135.

We may just add that a peculiar species of painting has lately arrived at great perfection in this country, and is most aptly denominated

PANORAMIC PAINTING. A gentleman of the name of BARKER was the first who adopted this mode of employing the pencil; it consists in a circular room painted all round, and in such a way, with the light properly introduced, that the spectator who ascends

into the middle of the room, appears in the midst of the scene whatever it be designed to represent. In this way Mr. BARKER painted and exhibited, many years since, the celebrated *Battle of the Nile ;* and his son also exhibited, in 1818, the *Storming of Algiers* by Lord Exmouth. But a *panorama* is now preparing by Mr. Horner, near the Regent's Park, in a building called the Colosseum, which bids fair to outstrip every thing of the kind exhibited in this country. It contains a *Panoramic view of London* as taken by Mr. Horner himself from the top of St. Paul's Cathedral; although not yet completed, it is partially opened to the public; those who have seen it, speak in high terms of its execution.

SCULPTURE, the art of carving in wood, stone, or other matter, and of forming various figures or representations therein; as also of fashioning wax, earths, plaster, &c. to serve as models for moulds for the casting of metalline figures. Sculpture includes the art of working in *low* and *high relief*, and *embossing :* high relief is, however, more strictly called sculpture.

The antiquity of this art is beyond question; the sacred writings mention it in several places; witness, Laban's idols stolen by Rachel, and the golden calf set up in the desert by the Israelites. The first works in sculpture were of clay; at the present time a sculptor never undertakes any considerable thing without forming a model either in clay, wax, or plaster.

The Egyptians were noted for colossal statues, as the head of *Memnon*, now at the British Museum, and the *Sphynx* proclaim; but their sculpture wants that graceful outline and elegance which nothing but considerable perfection in the art can bestow. To the Greeks, therefore, beyond all the ancients, must be conceded the palm of having arrived at great perfection in this art, as the numerous statues brought from Greece, and now at the British Museum, most strikingly evince: these statues are now constantly referred to and copied as models by our young artists.

In England are also some excellent specimens of sculpture, many of which it is impossible for us to mention; we may, however, observe that a fine bronze colossal statue of Achilles was erected in Hyde Park, a few years since, in commemoration of the victories of the Duke of Wellington, which will ever rank as a splendid monument of the age, and of the talent of WESTMACOT. That both in Westminster Abbey, and St. Paul's Cathedral are many monuments which do honour to this branch of the arts. In Westminster Abbey the monuments of the *Duke of Argyle* and Mrs. *Nightingale*, both by ROUBILLIAC, have been much admired. Of St. Paul's Cathedral it may be said, that *exteriorly* it is decorated with many statues of various merit, and with columns and capitals evincing the taste of Sir Christopher Wren, as the architect of that edifice; that in the interior, the monuments of the celebrated JOHN HOWARD, and of Dr. SAMUEL JOHNSON, both by BACON, do honour to the place and to the sculptor. It is almost invidious to name an individual living sculptor, but we cannot avoid noticing here the accomplished CHANTRY, whose works will long survive him.

Of STATUARY, as a branch of sculpture, it is scarcely necessary to say, it is that portion of the art which is employed in making statues. The invention of statuary is said to have arisen from the circumstance of a maid, full of the idea of her lover, having made the

first essay by the assistance of her father's implements, who was a potter: whether this be true or not, it is pretty certain that clay was the first matter used for statues. Statuary is also used for the person who makes statues. Pridial was the greatest statuary among the ancients, and *Michael Angelo* among the moderns.

We may just add that STATUES are formed with the chisel, of different kinds of stone; or moulded of different kinds of potter's clay, and hardened by fire; or are a composition of wax, coloured so as to resemble nature; or of plaster of Paris fashioned in moulds; or cast of various metals.

Statues are distinguished into four kinds: less than life; as large as life; those that somewhat exceed life: and those called *colossuses*, such as the Achilles in Hyde Park.

Whether the ancients or moderns have most excelled in sculpture, is, we believe, by dispassionate observers, yet undecided, although we ought to state that many good judges have awarded the palm to the ancients. Certain it is that in this, as in other imitative arts, excellence can only be attained by a study at the well-head—the everlasting fountains of nature. See what is said in the preceding articles, *Drawing* and *Painting*.

For an account of *Statuary* marble see page 130. For *Artificial marble* for statues, &c. see page 131.

CASTING, among sculptors, implies the taking of casts and impressions of figures, busts, medals, &c. The method of taking casts, figures, &c., is most generally by the use of *plaster of Paris*, which is prepared as mentioned in page 133. This substance is preferred, because, when moistened with water, it takes any form in or on the moulds, and because it becomes rapidly solid, and, when dry, very hard. Hence it is used for the moulds themselves, and for casts obtained from the moulds. Parchment size is mixed with water and the plaster, to render it more hard and tenacious.

RELIEVO or RELIEF, in sculpture, &c. is the projecture or standing out of the figure, which rises prominently from the ground or plane on which it is formed, whether that figure be cut with the chisel, moulded, or cast. There are three kinds of relievo, namely, *alto*, *basso*, and *demi relievo*.

ALTO RELIEVO, called also, *haut relief*, and *high relievo*, is when the figure is formed after nature, and projects as much as life.

BASSO RELIEVO, *bas relief*, or *low relievo*, is when the work is raised a little from the ground, as in medals, coins, and the frontispieces of buildings; and particularly in the histories, festoons, foliages, and other ornaments of friezes. When, however, the representation of a person is struck on a medal it is usually in *strong relief*.

DEMI RELIEVO, or *half relief*, is when one half of the figure rises from the plane. When in a *basso relievo*, there are parts which stand clear out, detached from the rest, the work is called a *demi basso*.

BUST, in sculpture, denotes the figure or portrait of a person in relievo, showing only the head, shoulders, and breast. Busts are commonly placed on a pedestal or console. Felibien observes, that though in *painting* we say a *figure is in busto*, yet it is not properly a bust, this word being confined to subjects in *relief*.

ENGRAVING is the art of cutting metals, wood, glass, precious stones, &c. and representing on them figures, letters, or whatever the

artist fancies. Engraving is properly a species of sculpture, and is divided into several branches according to the matter on which it is employed, and the manner in which it is performed.

Engraving is an art chiefly of modern invention, having its rise no earlier than the middle of the fifteenth century. It is true the ancients engraved on precious stones, &c. with success, as many of their works which remain prove; but the art of engraving on blocks of wood, and on metal plates, so as to afford prints or impressions, was not known till after the invention of painting in oil. The most ancient method of engraving is that on wood, the first impressions upon paper having been taken from carved wooden blocks. About the year 1450, prints from engraved copper first made their appearance in Germany. It has been stated, however, that the invention of copper plate engraving was accidental; that a goldsmith of Florence having placed a sheet of oiled paper under a plate of silver that was engraved, and on which by accident he had laid a heavy weight, was much surprised to find two days after, a complete impression of the plate upon the paper. This fact, which occurred in the fifteenth century, he communicated to some able painters, who laid the foundation of the art of engraving.

To insist on the advantages of this art is scarcely necessary; by it copies of the most exquisite pictures may be sent all over the world; and persons of moderate means are thus enabled to possess all that is poetical as well as true in the sister arts of drawing and painting.

We shall consider the most important branches of engraving separately; and first of

ENGRAVING ON COPPER. This kind of engraving embraces an infinity of subjects, such as portraits, landscapes, historical pictures, buildings; as well also as various patterns to be impressed on muslins, calicoes, &c. &c. Engraving is done either after paintings or drawings, or other designs made for the purpose. There are various *methods* of *engraving on copper*, the chief of which are the following:—

STROKE, or LINE ENGRAVING. This is usually considered the original art of engraving. The tools necessary for which are *gravers*, the *dry point* or *needle*, a *scraper*, a *burnisher*, an *oil-stone*, a *sand-bag* or *cushion*, an *oil-rubber*, and some good charcoal. The *gravers*, made of tempered steel, are fitted to proper handles; they are either square or in the lozenge form; the first is used for cutting very broad strokes, and the other for fainter and more delicate lines.

The copper, tools, and drawings being ready, and the plate covered with a thin skin of virgin wax, the drawing or picture is to be copied on paper with a black-lead pencil, or any matter that is free from gum: this paper is to be laid upon the plate with its penciled side upon the wax, and pressed all over so completely, that when the paper is withdrawn the impression may remain upon the waxed plate; then with a sharp pointed tool the design is traced through the wax on the copper. The plate is now to be warmed and the wax cleaned off, after which the engraving is finished with the gravers and the dry point, this last being used in the lightest parts of water, sky, &c. See the next article.

ETCHING was invented about the same time as engraving on copper, properly so called, by Albert Durer and Lucas. It has several advantages over that process, as it is done with more ease and expe-

dition, requires fewer instruments, and represents some subjects better than any other process: such are landscapes, architecture, and machinery. Etching is performed by heating the plate, well polished, over the fire, and when hot, covering it with a peculiar ground or varnish. When cold, the ground is blackened with the smoke of a candle; on this ground the back of the design is laid; it is then to be chalked or transferred upon the plate: the back of the design having been previously rubbed over with red chalk, nothing remains but to trace over all the lines and strokes of the draught with a needle or point, which pressing the paper close to the ground, causes the wax to lay hold of the chalk and thus gives a copy of the whole design; when thus chalked, the artist proceeds to draw the several lines with a point through the ground upon the copper. In finishing the work he uses points of different sizes, pressing upon them lightly or strongly according to the shades required. The plate being thus prepared, a rim of wax is raised around the edges of it, and aquafortis poured on it. When the acid has remained long enough to produce on the copper the finest lines, it is poured off, the plate washed and dried, and those lines which are to be made no deeper are to be stopped with turpentine varnish mixed with lampblack, and laid on with a camel's hair pencil; when this is thoroughly dry the acid is poured on again to produce the lines that are required to be deeper: thus the engraving is completed.

In almost all engravings on copper, executed in the stroke manner, etching and engraving are combined, the plate being generally begun by etching and finished with the graver.

ENGRAVING IN DOTS, without strokes, is executed with the point upon a wax or ground, bitten in with aquafortis, and afterwards harmonized with the graver, by which also small dots are made; or with the graver alone, as in the flesh and finer parts, unassisted by the point. Sometimes the dots are first etched and afterwards harmonized with the point: this is performed by a little hammer. Of late, however, the methods of engraving on copper have been so various that it would be endless to describe them. But there are two methods of fine engraving now very much practised, which it is necessary we should notice; one is *stippling*, which is performed by dots worked up so as to appear like mezzotinto, but infinitely preferable, as it has a softer yet more spirited effect. The other is a sort of stroke engraving in net-work lines, instead of parallel ones, to exhibit the costume and particular features.

MEZZOTINTO is an engraving on copper so as to form prints in imitation of paintings of Indian ink. This kind of engraving is recommended by the ease with which it is executed, especially by those who understand drawing. Prince Rupert is usually considered the inventor of this art, but a more probable account is, that it was De Seigen, an officer in the service of the Landgrave of Hesse, and that Prince Rupert learned the secret from him and brought it to England when he came over with Charles II. It is thus performed: the surface of the plate is raked, hatched, or punched all over with an instrument made on purpose, first one way and then the other, across, &c. till the surface of the plate is entirely furrowed with lines close to each other, so that if an impression were taken from it, it would be one uniform blot. This done, the design is marked on the same

face; after which, with burnishers, scrapers, &c. The dents or furrows in all the parts where the lights are to be, are expunged or taken out; and this more or less as the lights are to be stronger or fainter, leaving those parts black which are to represent the shadows or deepenings of the drawing. The instruments used in such engraving are cradles, scrapers, and burnishers.

The art of scraping mezzotintos has been applied to printing with a variety of colours, in order to produce the resemblance of paintings. The inventor of this method was J. C. Le Blon, of Frankfort, a pupil of Carlo Maratti, between 1720 and 1730.

AQUATINTA is a peculiar method of etching on copper, by which soft and beautiful prints are produced, resembling a fine drawing in water colours or Indian ink. This method of engraving has not been long invented; the chief processes are as follow:—

The copper being polished, lay the etching ground upon it, and etch the outlines in the usual way; then soften the ground with a little grease and wipe it off, leaving only as much grease as will dim the copper; next, take powdered asphaltum, yellow resin, or gum sandarach, and sift it upon the surface of the plate, when as much as is necessary will stick to the grease, and the rest may be shaken off; lastly, by holding the plate over a char-coal fire, the powder which adhered to the grease will be fixed to the plate. When the plate is cool all the light places where there is no work or shade, must be covered with ivory-black mixed with turpentine varnish. The aquafortis is now to be poured on, being first reduced to a proper strength by vinegar or water. Let the aquafortis stand five minutes for the first shade, then pour it off and wash and dry the plate. Next, stopping up the light with the varnish, pour on the aquafortis for the second tint, and let it stand five minutes more; proceed in this manner for every tint till you have produced the darkest shades. In etching landscapes the sky and distant objects are formed by a second operation, and the application of a finer powder. In Paris aquatinta designs are printed in colours, for which purpose several plates must be used, on each of which only the parts that are of the same colour are to be etched.

It is impossible, however, to describe the various processes of this elegant art with that minuteness to which our limits confine us; those who desire more information concerning it will of course consult Ree's Cyclopædia and other works in which it is more copiously treated.

COPPER PLATE PRINTING. The ink used for copper plate printing is composed chiefly of Frankfort black, mixed with nut-oil that has been well boiled, by being ground on a marble slab, in the same manner as painters grind their colours.

The *rolling-press* is distinguished into *body* and *carriage;* the body consists of two upwright posts joined at top by cross pieces, and placed perpendicularly on a wooden stand which sustains the whole. From this foot rise four other perpendicular pieces, joined also by cross ones: this may be considered as the carriage, as it serves to support a smooth plank, upon which the engraved plate is placed.

Into the cheeks are inserted two wooden cylinders, the ends of which, called *trunnions*, turn in the cheeks between two pieces of wood, in form of half moons, lined with polished iron, to prevent friction. The spaces left vacant by the trunnion are filled with pasteboard or paper, that they may be raised or lowered at discretion, so as only to leave

the space between them necessary for the carriage of the plank loaded with the plate, paper, and cloths, which consist of swan-skin, and a piece of broad-cloth. To one of the trunnions of the upper roller is fastened a cross, consisting of two levers, the arms of which give a motion to the upper roller, and that again to the under one, so that the plank is drawn, by this means, backwards and forwards.

The press and the ink being ready, the printer takes a small quantity of the ink on a rubber made of linen rags, with which he smears the whole face of the plate, as it lies on a grate over a small fire made of old coal. The plate being sufficiently inked, it is first wiped with a rag, then with the hands over which is rubbed a piece of whiting. The art consists in wiping the plate perfectly clean, without taking the ink out of the engraving. The plate is now laid on the plank of the press; over the plate is spread the paper previously moistened. The arms of the cross are now pulled, and the whole apparatus is carried between the rollers, and thus the impression is made.

Some works require to be passed through the press twice; once is sufficient for others. After the prints are taken off, the plate is rubbed over with olive oil, to prevent its rusting, and set by till it is again wanted.

ENGRAVING on WOOD is a process exactly the reverse of engraving on copper. In the latter, the strokes to be printed are sunk or cut into the copper, and a rolling-press is used for printing it; but in engraving on wood, all the wood is cut away, except the lines to be printed, which are left standing up like types: the mode of printing is the same as that used in letter-press.

The wood for the purpose of engraving is usually *box*, the best of which is imported from Turkey. The surface of the block being made very smooth, the design is drawn upon the wood itself with black lead, and all the wood is cut away with gravers and other proper tools, except the lines that are drawn; or sometimes the design is drawn upon paper, and pasted upon the wood which is cut as before.

This art is of considerable difficulty, and there are comparatively few who are masters of it. But latterly it has arrived at great perfection. The BEWICKS, of Newcastle, have excelled in it; and several artists now in London are eminent as wood-engravers. We may mention, among others, Mr. H. HUGHES, who is distinguished by the fidelity of his engravings of landscapes on wood; his *Views in Wales*, to the number of sixty, will ever remain a monument of his talents.

The best light to work at this kind of engraving is that passed from a lamp, through a glass globe filled with water, which, by its concentrating power, throws a suitable light on the engraver's cushion.

CARVING is the art of cutting a hard body by means of a chisel or other instrument. In this sense it includes statuary and engraving, but the term is generally confined to works in wood only, as ornaments for furniture, &c. &c. For such purpose, beech, box, and holly, being hard, tough, and close, are generally used; but we have seen some carved figures, executed with much taste, and imported as toys from Germany, made of deal.

ENGRAVING on GLASS is best effected by fluoric acid; see page 133; but the diamond most readily cuts glass.

SIDEROGRAPHY, literally a writing upon iron; but this term is applied to a kind of engraving on steel or iron, invented a few years since by Mr. JACOB PERKINS, of Philadelphia, now resident in Lon-

don, and for which invention he has obtained a patent. The chief processes of siderography are as follow :—

The subject is first engraved upon a block of steel, prepared by a peculiar process, and rendered so soft, that it may be cut by the same mode of engraving as copper. When the engraving on soft steel is finished, the block of steel is hardened, without injury to the engraving, and being placed in a rolling engine, a small cylinder of soft steel, is repeatedly worked upon the block until the cylinder has received the impression of the engraved block in relievo. This cylinder, after being hardened, becomes a tool by which steel or copper plates may be impressed with designs at pleasure.

By this process various kinds of engraving may be combined, and any number of plates may be impressed. One of the chief advantages of this kind of engraving is, the great durability of the plates. Twenty-five thousand impressions have been taken from one plate, without any apparent alteration in the correctness and delicacy in the execution. Indeed, siderography is considered one of the greatest improvements in the art of engraving which has been for many years made.

LITHOGRAPHY, a writing or engraving on stone, is a process that has, during the last ten years, made considerable progress in this country. The inventor of the art was Alois Senefelder, a German, who published a treatise on the subject in 1819.

By means of this art, the painter, the sculptor, and the architect are enabled to hand down to posterity as many fac-similes of their original sketches as they please. Men in office can obtain copies of the most important despatches or documents, without a moment's delay, and without the necessity of confiding in the fidelity of secretaries or clerks. To the merchant also the art is invaluable. The most extraordinary character of it consists in giving fac simile copies of either writing, drawing, or painting.

The art has three divisions, the *elevated manner*, the *engraved manner*, and the *mixed manner*.

In the *elevated* manner, all those parts of the stone which are covered by a greasy ink, resist the action of the acid poured over the whole surface of the stone, by means of which all the other parts become corroded. In the *engraved* manner, all those parts which are to give the impression, are engraved into the surface of the stone, by means of a sharp needle, or bitten into it by the action of an acid. The first admits of greater expedition in taking the impressions, and allows a greater number to be taken before wearing out ; the second admits greater nicety of expression. The *mixed* manner combines, of course, both the preceding.

The stones which are preferred for lithography are those of a whitish yellow colour, because the artist is best enabled to see the drawing on it. The thickness must always be in proportion to the size of the stone. The stones were, in the first instance, imported from Germany, but it is said that at Wilmcoats, near Stratford-upon-Avon, stones for lithography can now be obtained, equal in every respect with those brought from Germany.

The inks for lithography are of various kinds ; one is composed of wax, tallow, soap, and lamp-black ; others of shell lac, gum mastic, Venice turpentine, wax, tallow, &c. in various proportions, which our limits forbid our detailing.

The press consists of a box drawn by a wheel, a wooden scraper pressing on it with great power; after the first impression the stone is wetted afresh, again inked, drawn under the scraper, and so on.

There are several other parts of the process of lithography, which we cannot detail. Those who desire more information concerning it, will of course consult the treatises written professedly on the subject.

STENOGRAPHY, or SHORT HAND writing, is performed by certain characters instead of letters. In this art, the simplest characters are the best: such are strokes, curves, &c. horizontal, perpendicular, and inclined. The two great advantages to be derived from short-hand are *expedition* and *secresy.* Secresy may be acquired from private characters of any shape; but the utmost expedition can be obtained only by characters the most simple in their formation.

The ancients adopted various methods of abbreviation, but it was reserved for modern times to arrive at great perfection in this art; nevertheless, it is by no means a general acquisition: to those, however, who are conversant with public assemblies, whether religious, forensic, literary, or parliamentary, it is unquestionably of much value.*

We know not whether

FENCING is to be regarded as one of the fine arts, but as it is usually considered a part of the accomplishments of a gentleman, we make room for it here. It is the art of properly using the sword, as well for attacking an enemy as for self-defence. *Simple* fencing is performed nimbly and off-hand on the same line. In this the principal intention, in respect to the offensive part, should be, to attack the enemy in the most unguarded part; and in the defensive, to parry off the enemy's thrusts and blows. *Compound* fencing, on the offensive part, includes all manner of acts to deceive the enemy, by making him leave the part unguarded which we want to attack; such as feints, appeals, clashing and entangling of swords, half-thrusts, &c.; and on the defensive to parry and thrust at the same time.

FILLAGREE, a kind of enrichment on gold or silver, wrought delicately in manner of little threads or grains, or both intermixed. The Chinese make most of their fillagree of silver, which looks very elegant; but it is not equal to the fine gold and silver fillagree of Sumatra, where manufactures of this kind are brought to great perfection, notwithstanding the coarseness of the tools employed for the purpose.

INSTRUMENTS, MACHINES, ETC.

As several instruments, &c. such as the *Barometer*, *Thermometer*, &c. are used in various investigations connected with many of the arts and sciences detailed in the preceding parts of our work, it has been deemed more expedient to describe such under a general head, than to describe them under any particular science or art, to which few, if any, exclusively belong: of these, however, we can only men-

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* *Guy's System of Short Hand* is the result of twenty-five years' constant practice. In it all that is needful to be learned by heart, may be acquired in two or three hours; and a facility in writing in but as many days.

tion the most interesting and useful; there are many others which our limits only prevent us from describing, and for an account of which the student will, of course, refer to more voluminous works.

AIR-GUN.—A machine for propelling bullets with great violence by condensed air. An air-gun consists of a strong tube, into which the air is thrown, or condensed, by a syringe, or by other means; a valve is then suddenly opened, which lets the air escape by a small tube in which a bullet is placed, and violently forced out by the air, which escapes without noise. The first account of air-guns is in a work of Rivaut, who was preceptor to Louis XIII., of France; he ascribes the invention to M. Marin, of Lisieux. Air-guns have been greatly improved since their first invention.

AIR-PUMP.—A machine for extracting the air from vessels. The structure of the air-pump is more simple than even that of the common water-pump: for as air ascends by its own elasticity, it naturally leaves a vacuum; all the art, therefore, in constructing an air-pump is, to prevent the external air from supplying the place of what is drawn off; yet, although a comparative vacuum can be formed by the air-pump, a complete vacuum is scarcely possible by such means. The air-pump is, however, extremely useful for the performance of a great number of experiments connected with chemistry and pneumatics; by it we learn what the earth would be without an atmosphere, and how much all vital, generative, and nutritive power, depends on the air which surrounds us. The inventor of the air-pump was Otto de Guericke, of Magdeburg, in 1654. It has been since very much improved by Mr. BOYLE, Dr. HOOKE, Mr. SMEATON, and Mr. CUTHBERTSON.

BALLOON.—The principal machine used in the art of AEROSTATION, or art of navigating through the air. This art is of modern invention—the honour of having made the first successful experiments in it belongs to Mr. Cavallo, an account of which was read to the Royal Society in 1782. But it is said that Gusman, a Portuguese, had, early in the last century, launched a paper bag filled with air, which, however, fell on attaining the height of 200 feet. Soon after Mr. Cavendish's discovery of the specific gravity of inflammable air, Dr. Black suggested, in his lectures at Edinburgh, as early as 1767 or 1768, that a bladder filled with such air would form a mass lighter than atmospheric air; but, from other engagements, he did not pursue the subject, and therefore to Cavallo is the immediate honour of the discovery awarded. In the same year (1782) the *Mongolfiers* (brothers) invented, in France, the first large balloon of linen, lined with paper, and inflated it with heated smoke obtained from chopped straw and wool. This balloon contained upwards of 23,000 cubic feet of air, and was capable of lifting 500 pounds including its own weight. In ten minutes it rose to the height of 6000 feet, and fell, when exhausted, to the ground, at the distance of 7668 feet from the place it had left. Live animals were at first sent up in such machines; but at length men ventured into the hitherto unvisited regions of the air. The great difference, however, between the specific gravity of atmosphheric air and *hydrogen gas*, soon led to the abandonment of heated smoke, and thenceforward most balloons have been inflated with this last gas; latterly, in this country, *carburetted hydrogen* is the gas usually employed; although on a small scale, the combustion of spirit of wine will exhibit the phenomenon of the balloon, even when it is made of paper. Balloons are

usually made of oiled silk, and of very large dimensions; beneath is a car, attached by ropes to the machine, sufficiently large to contain one or more persons: they are now so commonly exhibited in the air, in and around the metropolis, as scarcely to be objects of wonder; they do not seem to have yet been made of much use; and the impossibility of impelling them in any direction, they being wholly at the mercy of the wind or currents of air, renders them little more than mere curiosities. One of the most perilous but successful voyages made with balloons was that of Blanchard and Jefferies, who crossed from Dover to Calais on the 7th of January 1785. They were in imminent danger of their lives, having been obliged to part with every thing in the car by which they were surrounded; and, at length, even with their clothes, to render the balloon buoyant. Many lives have, however, from time to time, been lost in these aerial excursions.

BAROMETER.—A machine for ascertaining the weight of the atmosphere, in order chiefly to determine the changes of the weather; hence usually termed a weather glass. It consists generally of a glass tube, somewhat more than thirty-one inches in length. It is filled with quicksilver, and immersed in a small bason of the same metal; the immersion being so made, that no air can ascend to the upper part of the tube; hence the small space above the quicksilver is usually a complete vacuum, and hence the ease with which the metal moves up and down in the tube, according as the atmosphere presses upon the quicksilver in the bason. The usual range of the barometer in this country is from twenty-eight to thirty-one inches; at twenty-eight the air is lightest; at thirty-one heaviest. Of course when the air is light, the vapours which are suspended in it when it is heavy, must fall to the ground. This fact, together with the change of temperature from heat to cold, &c. accounts for rain, dews, fogs, &c. When high winds blow, the quicksilver is generally low; it rises higher in cold weather than in warm; and is also higher at morning and evening than at mid-day. In hard frost the air is purest and heaviest, the barometer then being at its highest point.

The barometer is also used for measuring the height of hills and mountains, as well as depths of mines. It sinks about one tenth of an inch at the height of ninety feet from the level of the sea. Thus, when the quicksilver is (at that level) 30 inches, at 1000 feet of height it is 28.91 inches; at 2000 feet, 27.86 inches; at 3000 feet, 26.85 inches; 4000 feet, 25.87 inches; 5000 feet, 24.93 inches; 1 mile, 24.67 inches; 2 miles, 20.29 inches; 3 miles, 16.68 inches; 4 miles, 1372 inches. In measuring mountains by the barometer it is necessary to ascertain the temperature of the air at the top and bottom, and if different at the two places, allowing for such difference, the height can be accurately found by this instrument. There are several kinds of barometers, but we cannot describe them.

BLOW-PIPE; an instrument by which the breath may be directed in a stream upon the flame of a lamp or a candle, in order to produce an intense heat for melting, in small quantities, a variety of metallic and other substances. The most common blow-pipe is a tube of brass or iron, bent near one of the ends, and drawn out sufficiently fine to keep up a constant stream of air when blown into at the opposite end. A variety of blow-pipes have been invented: one by PAUL, in which the flame is produced by the vapour of alcohol: another by NEWMAN, in which a high temperature is obtained by a mixture

of hydrogen and oxygen gases: on this Mr. Gurney made some improvements. The most valuable treatise on the blow-pipe is by BERZELIUS, which was translated into English, and published with copious notes by Mr. Children in 1822.

BURNING-GLASS, and BURNING MIRROR, are machines by which the sun's rays are collected into a focus or point, where their heat is extremely heightened so as to burn many objects, and melt others of difficult fusion placed in them. The use of burning glasses appears to be very ancient. Diodorus, Siculus, Lucian, Galen, &c. attest that, by them, Archimedes set fire to the Roman fleet at the siege of Syracuse. But, although this may be questioned, we know that burning-glasses possess great power. Sir Isaac Newton presented a burning-glass to the Royal Society, consisting of seven concave mirrors so placed, that all their foci join in one point; each glass is about 11 1-2 inches in diameter. This glass vitrifies brick or tile in a second, and melts gold in 30 seconds. By Macquer's speculum, black flint bubbled up and ran into transparent glass in less than half a minute. One of the most powerful burning lenses, constructed by PARKER, is three feet in diameter; it melted twenty grains of pure gold in four seconds; ten grains of platina fused in three seconds. This lens is now in the possession of the Emperor of China, and cost 700*l.* It should be mentioned, that burning-glasses are of two kinds, *concave* and *convex: concave* mirrors *reflect* the rays of light back upon a point or focus; *convex* collect the rays of light into a point or focus. Parker's is a *convex;* Sir Isaac Newton's a *concave* burning glass.

CAMERA OBSCURA, or DARK CHAMBER, an optical arrangement, by which images of external objects are exhibited distinctly, and in their native colours, on a white ground, within the chamber or room, at the top of which the reflecting glasses are fixed. Friar Bacon was the inventor of this in the 13th century; but it has been, by some erroneously attributed to Baptista Porta. A miniature picture thus shewn is a pleasing object; and consequently the *camera obscura* is a source of interesting amusement. To those unaccustomed to sketching, it affords an opportunity of delineating objects and prospects with the utmost exactness; a painter may derive considerable advantage from the study of such living pictures. In the construction of this apparatus, a convex lens and plane mirror are its principal parts; these are arranged differently, according as it is required to be *portable* or *stationary.* Although the modifications of this apparatus are numerous, they all depend upon the same principle.

The CAMERA LUCIDA, or LIGHT CHAMBER, was invented by Dr. WOLLASTON, in 1807, for the purpose of delineating distant objects, and for copying and reducing drawings. It consists of a quadrangular glass prism, with lenses, &c. by which the rays from an object are twice reflected. There are several kinds of this instrument.

CHAIN, the MEASURING, or GUNTER'S, is commonly made of iron wire; it is in length 4 poles, 66 feet, or 22 yards; it is composed of 100 portions called links, and is adapted to the business of surveying land, as well as measuring lengths. Ten square chains making exactly an English acre of land, that is 4840 square yards. Eighty chains make one mile in length; or 1760 yards.

There are several chains of this kind; one is 50 feet long; anoth-

er is a pole, or 16 1-2 feet in length, useful for laying out gardens, &c. by the pole or rod.

CRANE, in mechanics, a machine used in buildings on wharfs and in warehouses for raising and lowering huge stones, and heavy bodies of various kinds. There are several kinds of cranes, among which those invented by Gottlich, Andrews, Hale, Whyte, and Hardie may be mentioned.

DIVING-BELL ; a machine contrived for the safe conveyance of a diver to any reasonable depth, and by means of which he may remain a considerable time under water.

Dr. Halley's diving bell was three feet wide at top, five at bottom, eight feet high, and contained nearly eight hogsheads in concavity. It was coated with lead, so as to sink when empty, and the weight was so distributed about the bottom, that it would go down in a perpendicular position, and in no other. In the top was fixed a strong but clear glass, to let in the light from above ; and below was fixed a circular seat for the use of the divers. It was suspended from the mast of a ship by a sprit. Two casks of about 63 gallons each, cased with lead, were sunk empty to supply the bell with air. This bell was so improved by the Doctor, that he could detach one of his divers to the distance of fifty or a hundred yards from it by a cap or head-piece made of lead, having a glass in it for him to see his way. To the top of it was attached a flexible pipe, communicating with the bell by which he had air when he wanted it. This pipe he used as a clue to find his way to the bell. The sinking and raising of this bell depending entirely on the people at the surface of the water, a diving-bell was some time since invented by Mr. *Spalding* of Edinburgh, which obviates these inconveniences, and renders the art of diving under water by a bell at once useful and safe ; but we have not room to describe Mr. Spalding's improvements.

The oldest information which we have of the use of the diving-bell in Europe, is by John Taisnier, who was born at Hainault, in 1509. He relates having seen two Greeks, at Toledo, let themselves down under water in an inverted kettle, with a burning light, and rise up again without being wet. William Phipps, a native of America, encouraged by a subscription, searched a rich Spanish ship, sunk on the coast of Hispaniola, in 1687, and obtained from it, by means of the diving-bell, treasure to the value of two hundred thousand pounds sterling.

Besides the diving apparatus mentioned above, many others have been invented and used. One of the latest is that contrived by Mr. *Tonkin*, to raise the property which was sunk in the East India ship Abergavenny some years since. It consists of a body of copper with iron boots, and joints as in coats of mail. The whole is covered with leather, and afterwards with canvas painted white. The arms are made of strong water-proof leather, and the place for sight is about eight inches diameter, and glazed with glass an inch thick. The diver is sunk in this machine by weights, and is suspended by a rope. At the top is an air tube communicating with the vessel above, by means of which the diver gives his instructions, and obtains his supply of air.

ELECTRICAL MACHINE. Various apparatus have been invented for the collection and exhibition of electrical phenomena ; one of the simplest and most perfect is that invented by *Nairne :* it consists of a glass cylinder from eight to sixteen inches in diameter,

and from one to two feet long, supported for the purpose of insulation, on two upright glass pillars, which are fixed to a firm wooden stand. Two hollow metallic conductors, equal in length to the cylinder, are placed parallel to it, one on each side, upon two insulating pillars of glass, which are cemented into separate pieces of wood that slide across the base, so as to allow of their being brought within different distances from the cylinder. To one of these conductors a cushion is attached, which is kept equally pressed against the cylinder by a spring, and is also further regulated by an adjusting screw. From the upper edge of the cushion proceeds a flap of thin oiled silk, which extends over the upper surface of the cylinder, to within an inch of a row of metallic points, similar to the teeth of a rake, projecting from a horizontal rod fixed to the adjacent side of the opposite conductor. The motion of this cylinder, which may be communicated either by a handle or a multiplying wheel, must always be given in the direction of the silk flap. See ELECTRICITY, page 103.

FIRE-ENGINE, a machine for extinguishing accidental fires by means of a stream or jet of water. The common squirting engine consists of a lifting pump placed in a circular or cylindrical vessel of water, and wrought with two levers, which act always together. During the stroke, the quantity of water raised by the piston of the pump spouts with force through a pipe joined to a pump barrel, and made capable of any degree of elevation by means of a yielding leather pipe or by a ball and socket, turning every way, screwed on the top of the pump. On this engine there have been many improvements.

FIRE-ESCAPES are of various kinds. Some years since a patent fire-escape, invented by Mr. MORRISON, attracted much attention, and is a very ingenious contrivance; the facility with which it operates is such, that many persons may be let down with it from a four pair of stairs window in three minutes. We are sorry that we have not room to describe it.

A GALVANIC APPARATUS may be composed in various ways; but the best form hitherto devised, consists in troughs made of earthenware, with partitions of the same materials, and the alternate metallic plates of zinc and copper, are attached to a bar of wood, so that they can be immersed and removed at one operation. The troughs are filled with diluted acid, as mentioned in page 103, and by uniting them in regular order the apparatus may be enlarged to any extent; it is thus that the great apparatus at the Royal Institution is constructed.

GASOMETER or GAS-HOLDER, a vessel or rather apparatus used for the purpose of receiving, retaining, and measuring gas. Small gas-holders are commonly made of glass in the shape of an oblong bell; some have a neck with a glass stopper at the top; some are also graduated into cubic inches, and supplied with a stop cock at the neck. Large quantities of gas are contained in cylindrical vessels, the open ends of which are immersed in large tubs of water, and as the gas ascends in the gasometer, that vessel rises out of the water to a considerable height. The gasometers of gas-works will often hold several thousand gallons of gas each. The Gas-works in Peter Street, Westminster, are well deserving the inspection of the curious and scientific. Some gasometers are made on a small scale, similar to the large ones in gas-works.

The HYDROMETER is an instrument for ascertaining the weight of water and other fluids. Hydrometers are of various kinds. One of great delicacy consists of a ball of glass three inches in diameter, with another joining it, and opening into it, of one inch in diameter, and having a brass neck, into which is screwed a wire, about ten inches long and one fortieth of an inch in diameter; it is divided into tenths of an inch. The whole weight of this instrument, when loaded with shot in the lower ball, is 4000 grains. When it is plunged into water, a grain laid upon the top makes it sink one inch; therefore, a tenth of a grain sinks it the tenth of an inch. Now, it will stand in one kind of water an inch lower than in another, which shows that a bulk of one kind of water, equal to the bulk of the instrument, weighs one tenth of a grain less than an equal bulk of the other kind of water; so that a difference in specific gravity of one part in forty thousand is thus detected. The instrument thus prepared is convenient for comparing waters: but the quantity of shot in the lower ball may be varied, so as to adapt it to ascertain the gravities of lighter or heavier liquids than water.

HYGROMETER, an instrument by which the degree of temperature is readily noted at which moisture begins to be deposited upon a cold body; as we see in summer, when a bottle of wine is brought from a cellar, or a decanter of water fresh filled from a well. This degree is called the *dew-point.* Hygrometers are of various kinds: whatever swells or shrinks by drying or moisture may be a hygrometer; as woods, cat-gut, &c. Tables have been prepared and generally accompany this instrument. Kater's hygrometer made of the beard of a grass growing in the East Indies, the *Andropogon contortum* of Linnæus, called in India *oobeena hoola,* has been well recommended.

INSTRUMENTS, a Case of, is a very useful appendage to every one who desires to pursue with success mathematical, mechanical, and other studies in which diagrams of various kinds are necessary. It consists usually of several pairs of compasses, a scale, brass pens, a brass semi-circle or protractor, on which are engraved the degrees of angles, a one foot rule, &c., &c.

LAMP, the SAFETY, was invented by Sir Humphry Davy, for the use of coal miners. It consists of a cylinder of wire gauze, about four inches in diameter and a foot in length, having a double top securely and carefully fastened by doubling over to a brass rim, which screws on to the lamp itself below. The whole of the wire gauze is protected and rendered convenient for carrying by a triangular wire frame, and a ring at the top. The wire gauze is made either of iron or copper; the wire should be at least one fortieth of an inch thick, and thirty in the warp, and sixteen or eighteen in the woof, if *twilled;* if *plain,* the wire should not be less than one sixtieth of an inch in thickness, and from twenty-eight to thirty for both warp and woof in the square inch. Brass wire is improper, nor should either the iron or copper wire be tinned. The body of the lamp should be of copper riveted, or of massy cast brass, or cast iron; the screws should fit tight, and no aperture, however small, should be in the body of the lamp; the trimming wire should move through a long tight tube.

This lamp has been very generally adopted in mining districts, where hydrogenous gas abounds, and it is, in general, a protection against the dangers arising from explosive mixtures of gas; some mischief has however arisen even with the use of the *Davy,* as it is

termed by the miners, and in consequence, attempts have been made to lessen, if not totally get rid of, all the danger in mines from gaseous mixtures. Mr. DILLON has proposed what he calls an *Improved* Safety Lamp. The improvement consisting in a shield of talc, to protect the lamp from a current of explosive gas; and he states, that with the lamp thus armed the shafts or workings of mines may be lit with gas with perfect safety.

LIFE BOAT, a boat invented by Mr. Greathead for preserving the lives of shipwrecked persons. It is thirty feet long and ten feet wide. It is lined both inside and outside the gunwales, to the depth of two feet, with cork; the seats are also filled with the same material. The quantity of cork used in its construction is about seven hundred weight. It is rowed by ten men, and steered by one at each end with oars, being alike in its form at both ends, and so contrived as not to sink in the sand. It draws very little water, and can carry twenty persons even when full of that fluid. Being water proof, and rendered buoyant by the cork, it always keeps afloat, preserving its equilibrium without danger of oversetting, and can contend against the most tremendous sea, never having failed in a single instance of conveying a distressed ship's crew in safety to the shore.

LOOM, a machine for weaving various cloths of linen, cotton, wool, silk, &c. The improvements in, and even the patents obtained, for looms are almost innumerable. The *warp* is the threads, whether of silk, wool, or other materials, extended lengthwise on the loom. The *woof* is the thread which the weaver shoots (by means of a little instrument, round which the thread is wound, called a *shuttle*) alternately from right to left and from left to right across and between the threads of the warp, which are made to move up and down alternately, by treadles operated upon by the foot. See page 161 and 162.

MICROSCOPE, an optical instrument composed of lenses, or mirrors, by which small objects appear larger than they do to the naked eye. Microscopes are distinguished into simple and compound, or single and double. The first kind consist of a single lens or a single spherule; the last of several lenses duly combined. By microscopes an infinity of animals have been discovered not visible to the naked eye. In a drop of water or vinegar, we can by these instruments perceive a multitude of *animalcula* of different kinds, and moving with great agility.

Microscopes are also divided into *reflecting*, *water*, *solar*, *botanical* microscopes, &c. A *fluid* microscope is made by simply dropping balsam of Canada, capivi, or pure turpentine varnish, on a parallel piece of glass, when a plano-convex lens will be formed. When the first of these substances is used it soon becomes indurated, and if kept from dust, very durable. We may just mention here that,

The MAGIC-LANTERN is constructed similarly to the *solar* and *lucernal* microscope, but the object and field glasses have larger diameters, and longer foci to admit more extensive objects, which are usually painted representations of familiar or grotesque subjects on glass sliders, having the parts, not occupied with the design, blackened, to obstruct the passage of light.

The PHANTASMAGORIA, occasionally exhibited, consists of a magic-lantern on a large scale, and having the object sliders painted

in the same manner; but instead of being exhibited on an opaque surface, the figures are thrown on a transparent substance.

MICROMETER, an instrument by which the apparent magnitudes of objects viewed through telescopes, or microscopes, are measured with great exactness. Its general principle is, that it moves a fine wire parallel to itself in the plane of the picture of an object formed in the focus of the telescope, and thus measures its perpendicular distance from a fixed wire in the same plane.

The KALEIDOSCOPE is an instrument invented by Dr. Brewster, in 1814, and for which he subsequently obtained a patent. It is said, however, that the invention is not a new one: for that a person named Bradley mentions such an instrument in a work published more than 100 years ago. It consists of a hollow tube of brass, or tin plate, and of any length, commonly from six to twelve or more inches, and from one to two inches in diameter. Two pieces of plate glass are so arranged within it as to exhibit broken fragments of coloured glass and other matters, as the instrument is gradually turned round, in new, interesting, and ever varying forms.

OBSERVATORY, a place destined for observing the heavenly bodies; it is usually a building in the form of a tower, raised on some eminence, and covered with a terrace. The most celebrated observatories are the following: *Greenwich*, built in 1676 by order of Charles II. FLAMSTEAD was the first astronomer to whom the province of making observations in this observatory was assigned; here he made many of great value, chiefly, however, regarding the moon. This observatory is in latitude 51° 29′ north. To Flamstead succeeded *Dr. Halley*, next *Dr. Bradley*, next *Mr. Bliss*, then *Dr. Maskelyne*, one of the most indefatigable of our astronomers; and lastly, *Mr. Pond*, who is now the astronomer royal.

The *Observatory of Paris*, built by Lewis XIV., in the Fauxbourg St. Jaques, is eighty feet high; on the top is a terrace. There is also in this observatory a cave, or pit, one hundred and seventy feet deep, for experiments that are to be made far from the sun, &c., especially such as relate to congelation, refrigeration, &c. Its latitude is 48° 50′ north, longitude 2° 20′ east of Greenwich. *Tycho Brahe's* observatory was on the island of Ween, or Scarlet Island, between the coasts of Schonen and Zealand, in the Baltic. In the *Pekin Observatory*, erected by the late Emperor of China by the advice of some Jesuit missionaries, the instruments are exceedingly large, but the divisions less accurate, and the contrivance in some respects less commodious than those of Europeans. Besides these, and the *Bramin's Observatory* at Benares, in the East Indies, there are also good observatories at *Lilienthal*, at *Dublin*, at *Oxford*, at *Berlin* and elsewhere; as well as many other useful private observatories.

ORRERY, an apparatus for representing the motions, and various appearances of the sun, planets, &c., and hence, with more propriety, might be called a *Planetarium*. The original inventor of the orrery was Mr. GRAHAM; but Rowley, a mathematical instrument maker, having obtained one from Graham copied it, and the first he made was for the Earl of Orrery, by whose name it was, in compliment to his lordship, called by Sir Richard Steel; which name it still, very improperly, retains. Considerable improvements have been since made on the original design of Graham.

PEDOMETER, or PODOMETER, an instrument in the form of a watch, consisting of various wheels with teeth catching in one another, all disposed in the same plane, which, by means of a chain, or string, fastened to a man's foot, or to the wheel of a chariot, advance a notch each step, or each revolution of the wheel, so that the number being marked on the edge of the wheel the paces may be numbered, so as to measure exactly the distance from one place to another. Pedometers are of various kinds: some mark the time like a watch, and are accordingly worn in the pocket.

PENTAGRAPH, an instrument by which drawings may be copied upon a similar, reduced, or enlarged scale at the will of those who use it, and without requiring any skill in drawing; yet it is said that few pentagraphs can describe even straight lines with any tolerable correctness.

PNEUMATIC APPARATUS. We have alluded to this apparatus in page 102. It may be made of various materials and various shapes; of wood, or iron, tinned and varnished, and round or square. If of wood, it may be round, a sort of shallow tub with a shelf across it, at a few inches from the top, and covering one half of its diameter. When used, it is to be filled with water, so that the shelf shall be covered with that fluid to the depth of an inch. When any gas is to be obtained, from whatever materials, a bell glass is filled with water and placed upon the shelf, when the water, having no access to the atmosphere, will remain in the bell glass; a stream of gas is now to be directed under the shelf, which may have perforations in it, that the gas may ascend into the glass and supply the place of the water; and thus, with suitable dishes, the gas may be removed in the bell glass to any other place, or in fact, bottled in a similar way that it is made to ascend the bell glass. This is one of the most simple and convenient apparatus for such purposes which has ever been invented; and without which few operations in pneumatic chemistry can be carried on.

PRISM, in geometry, a solid body whose two ends are any plain figures which are parallel, equal, and similar; and its sides connecting those ends parallelograms. Prisms are either triangular, square, pentagonal, hexagonal, &c.

Prism, in optics, is a piece of glass in form of a triangular prism, much used in experiments concerning the nature of light and colours. See OPTICS.

PROJECTILES, such bodies, which being put into violent motion by any great force, are cast off or let go from the place where they receive their impulse; as a stone from a sling, an arrow from a bow, a bullet from a gun.

PROTRACTOR, an instrument used for laying down on paper the angles of a field, or other figure. It consists of a small semicircle of brass or other solid matter; the limb or circumference of which is nicely divided into 180 degrees. It serves not only to draw angles on paper, or on any plane, but also to examine the extent of those already laid down. Protractors are now usually made in the form of a parallelogram, and properly graduated at the upper edge.

PYROMETER, an instrument used for measuring high degrees of heat. The pyrometer was invented by Musschenbroek; who employed solid rods of metal to indicate high degrees of heat. Smeaton, De Luc, and others, have also invented pyrometers. Mr. Wedg-

wood invented a pyrometer, or cube of *clay*, which, contracting by heat, shewed the degrees of it with tolerable exactness for the purposes of the potter; but as a philosophical instrument it is imperfect. A platina pyrometer was invented in 1804, by Guyton de Morveau. Nearly the last, and we presume the best, is the pyrometer of Mr. DANIELL, the moving power of which is a rod or wire of platina 10.2 inches in length, and 0.14 inch in diameter, fixed in a tube of black-lead ware by a flanch within, and a nut and screw without. This tube has a shoulder moulded on it for the convenience of always inserting it into the furnace or muffle to the same depth. Attached to this instrument are two wheels, a platina wire, and a dial and index, by which the degrees of heat are accurately measured. Messrs. Breguet have also lately constructed a most elegant and delicate pyrometer, or metalline thermometer, which our limits only prevent us from describing.

QUADRANT, SEXTANT, and OCTANT are similiar instruments, used for taking the sun's altitude at sea, and for other purposes; they are so called according as they are divided into a *quarter*, a *sixth*, or an *eighth* of a circle, which is marked in degrees upon their outer edges; they are also in shape respectively a fourth, a sixth, or an eighth of a circle.

RAIL-WAY, or RAIL-ROAD, a modern contrivance for facilitating the conveyance of heavy goods. It consists simply of smooth bars or plates of iron placed horizontally, in two rows parallel to each other, at a convenient distance, to receive the wheels of a carriage; the road on which the horse draws lying between the two parallel rows or ranges of plates. The wheels of the carriage are usually constructed with a groove running round them so as to apply freely to the rails without slipping off; sometimes indeed, now we believe most commonly, this is effected by an elevation of about two or more inches on one side of the rails, the wheels in such case being flat. On such roads one horse will draw more than six can upon a common turnpike-road. Rail-roads are very common in the mining districts of this country, and in some other places. There is a rail-road for the conveyance of coal, &c. from *Gloucester* to *Cheltenham*, a distance of ten miles. But the *Liverpool* and *Manchester Railway*, now in course of completion, is the most important and extensive enterprise which has been for a long time witnessed.

SPEAKING-TRUMPET, a tube from two to fifteen feet in length, made of tin, perfectly straight and having a very large aperture, the mouth-piece being wide enough to admit both lips. By means of this instrument the voice is carried to the distance of a mile or more. It is chiefly used at sea.

STEAM-ENGINE, a machine whose motive power is steam. It is used on innumerable occasions where a powerful effect is wanted for the impulsion of machinery, ships, and many other things. Steam-engines are of several kinds. The chief, however, are *high pressure* steam-engines, where the excess of pressure is regulated by a safety valve, such are the steam-engines used in the navigation of vessels; —*low pressure* engines, where the steam is condensed as described below;—*reciprocating* engines, as most engines till lately were, the machinery being kept in motion by a revolving crank; or *rotatory* engines, where the steam is at once applied to produce rotatory motion without that loss of power by friction, which defect belongs to all re-

ciprocating-engines. As however, although several rotatory engines have been invented, we are not aware that one has been found likely to supersede those of the reciprocating kind, we shall endeavour to give our young readers a short view of a low pressure *steam-engine*, which consists of a forcing pump with its rod fixed to one end of a lever, that is worked by the pressure of the atmosphere upon a piston at the other end, a temporary vacuum being made below it, by suddenly condensing the steam that had been let into a cylinder in which the piston works, by a jet of cold water thrown into it. A partial vacuum being thus made, the weight of the atmosphere presses down the piston, and raises the other end of the straight lever loaded with water, &c. when adapted to a mine. Then immediately a hole is uncovered in the bottom of the cylinder, by which a fresh supply of hot steam rushes in from the boiler, which acts as a counterbalance to the atmosphere above the piston, and the weight of the pump rods at the other end of the lever carries that end down, and of course raises the piston of the steam cylinder. The orifice for the emission of steam is immediately shut, and the cock opened for injecting the cold water into the cylinder: this condenses it to water, and another vacuum is made below the piston, which is now again forced down by the weight of the atmosphere, and thus the work is continued as long as water and fuel are supplied. This is the common principle of the low-pressure steam-engine, but the methods of its operation are very various, which, of course, we cannot describe. The first idea of the steam-engine has been usually attributed to the Marquis of Worcester, in 1663; but an Italian philosopher of the name of Brancas had previously invented a sort of steam-engine of the high pressure kind; indeed it is now confidently asserted by Mr. Partington, that to *Hero of Alexandria*, who lived about two thousand years ago, we are indebted for the first steam-engine. To the Marquis of Worcester, succeeded *Savery*, *Newcomen*, and Watt, to whom it mainly owes its present state of perfection. It appears that there are now in effective operation in the united kingdom about fifteen hundred steam-engines, from *one*, *two* or more, up to one in Cornwall of *six hundred* horse power. Upon the most accurate estimate those fifteen hundred steam-engines will do the work of a million of men. It should be mentioned that loaded carriages on some rail ways have been impelled by steam; but on our common roads *steam carriages* have not been yet successfully established, although attempts to perfect them are continually made: those of Mr. Gurney seem to promise most.

STEAM-BOAT, a boat or vessel impelled by steam; this is one of those triumphs of science which give a character to the age. The first steam-boats were established about twenty years ago in the United States of America, since which, navigation by steam has pervaded very generally the shores, rivers, and estuaries of the united kingdom and even the ocean; steam-boats having not only come from America to Europe, but one has gone to the East Indies from this country. The chief utility of these boats consists in conveying passengers from one place to another, as from London to Edinburgh, Dover to Calais, Bristol to Cork, &c. &c. A description of one of these boats, not of the largest kind, may give an idea of them all: it is 75 feet long; breadth 14, height of the cabins $6\frac{1}{2}$ feet. The best, or aft cabin is 20 feet long, between the aft cabin and the engine a space of 15 feet is allotted for goods. The engine is a twelve horse

power, and occupies 15 feet. The fore cabin is 16 feet long. The *paddles*, 16 in number, form two wheels, one of which is fixed to each side of the boat, of nine feet in diameter, and four feet broad, made of hammered iron; they dip into the water from one foot three to one foot six inches. Along the outer edge of these wheels a platform and rail are formed quite round the boat, projecting over, and supported by timbers reaching down the sides. It can accommodate 250 passengers, and is worked by only *five* men. The funnel of the boiler is 25 feet high; and carries a square sail 22 feet in length. The steam-boats on the Thames are constructed somewhat differently from this; they are also, many of them, considerably larger.

STEAM-BOILER. We may just add in regard to steam-engines, steam-boats, and indeed every thing of which steam is the exciting agent, that in every steam apparatus there must be a *boiler* to create and compress the steam; pipes to convey it; receptacles to contain it for the purposes for which it is designed; waste pipes to convey away the cooled water; and a *safety valve* at the boiler to regulate the pressure of the steam. The boiler is usually made of copper; and of whatever size it may be wanted, and for whatever purpose it may be desired, the boiler must be essentially the same. It is the fundamental article of every steam apparatus.

SYPHON, or SIPHON; a bent pipe, one end of which being put into a vessel of liquor, and the other hanging out of the said vessel over another, the liquor will run out from the first into the last, after the air has been sucked out, or otherwise removed from the tube, and that as long as the liquor in the upper vessel is above the orifice of the syphon. Sometimes it is inconvenient to suck out the air, in which case filling the syphon with the liquid to be abstracted, and immersing it in a proper manner, will answer the same purpose. Some syphons are made of glass, others of copper; some are furnished with cocks.

TELEGRAPH, literally means that which writes, or is used for writing, at a distance; and is the term applied to an apparatus used, for some time past, by several European governments to convey information to distant places almost instantaneously. Although this invention was only brought into use during the late French Revolution, some sort of telegraphic intelligence was, it is said, known to the Greeks. The Marquis of Worcester, in 1663, mentions a kind of telegraph in his "Century of Inventions," but it was reserved for our own times to render such a mode of communication at once speedy and correct. The modern telegraph, first used by the French in 1794, by M. Chappe, was thus exercised: at the first station, which was on the roof of the Louvre, he received in writing, from the committee of public safety, the words to be sent to Lisle, near which the French army at that time was. An upright post was erected at the Louvre; at the top of this were two transverse arms moveable in all directions with much rapidity. The different positions of these arms stood as signs for the letters of the alphabet. Having received the sentence to be conveyed, he gave a signal to the second station to prepare. At each station was a watch tower on which telescopes were fixed, and the person on the watch gave the signal of preparation which he had received, which was communicated successively through all the line. The person at the second station then received letter by letter the sentence from the Louvre, which he repeated by his own machine, and thus throughout the whole line of

stations it was repeated with almost inconceivable rapidity to the final station at Lisle.

The most common telegraph in this country was, till lately, composed of six moveable boards about three feet square each, turned by means of ropes, so as to exhibit twenty-four different characters, and nine figures; such a telegraph was for many years at the Admiralty, at Whitehall; but for some time past another telegraphic method has been adopted there; it consists of a tall pole, or hollow cylinder with projecting arms that can be moved and withdrawn at pleasure. Whatever might be the use of telegraphs in time of war and commotion, they are now very little employed. Some of the stations in this country are abolished.

TELESCOPE, an optical instrument consisting of a hollow tube, with lenses, by which distant objects are seen as if they were much nearer than they really are; in other words, are *magnified* so as to appear much nearer than they seem when seen by the naked eye. The invention of the telescope is ascribed to different persons,—to Baptista Porta, to Jansen, and to Galileo. It was first constructed about 1590. Telescopes are of two kinds, *refracting* and *reflecting*. The simplest *refracting* telescope consists of two convex lenses, so combined as to increase the apparent angle under which distant objects are seen. By adding more lenses, and placing them at certain distances from one another, the powers of the telescope are prodigiously increased. *Reflecting* telescopes are of various structure; two of this kind have excited much of the public attention. The first, of the late Sir William Herschel, was erected at Slough, near Windsor, and consisted of an open iron tube 40 feet long, and 4 feet 10 inches in diameter; at the bottom was placed a polished metal speculum or mirror, which weighed, when taken from the cast, 2118 lbs. It was erected on the 28th of August, 1798; and on the same day the sixth satellite of Saturn was discovered. With proper eye glasses this instrument magnified above 6000 times. But the frame of it having greatly decayed, it was taken down in 1822, and a smaller one of 20 feet focus and 18 inches in diameter erected in its place by Mr. J. Herschel, Sir William's son.

Another reflecting telescope, the largest at present in this country, is now at the Royal Observatory at Greenwich, where it was erected by Mr. Ramage, in 1820. The diameter of the concave reflector is 15 inches, and its length or focus 25 feet.

It should be mentioned that in these reflecting telescopes the observer looks down into the tube, and not through it as in other telescopes. In both, a stage or a gallery is provided for the observer, whose back is turned from the object in the heavens which he is desirous of examining by means of such telescopes. They are both supported by frame work and pullies, by which they may be lowered or raised at pleasure.

Of the utilities of telescopes it is almost unnecessary to speak; that they have made us acquainted with many things in the heavens but for which we should have remained in total ignorance cannot be doubted; and they thus also afford *data* for astronomical and nautical purposes.

THEODOLITE, an instrument much used in surveying, for taking angles, distances, and altitudes. It is variously made. The common one consists of a brass circle almost one foot in diameter, having

its limb divided into 360 degrees, and each degree into minutes. The better kinds of this instrument have a telescope, a vertical arch, &c. attached to them. The finest theodolite ever made was by Ramsden, and employed in the trigonometrical survey of England. The use of the theodolite is abundantly shown in that of the semi-circle, which is only half a theodolite : and that of the *Plain Table* which is occasionally made to be used as a theodolite.

THERMOMETER, an instrument to ascertain the degree of heat or cold of any body, particularly of liquids and the air. All bodies expand with heat and contract with cold, (except *water*, which attains its greatest degree of density at 40°.)* If quicksilver be put into a glass tube, its swelling and rising in it shows that it has acquired more heat than when placed there ; and by its sinking and contracting it is demonstrated that it has parted with a portion of its heat, in other words, has become *hotter* or *colder* in the exact proportion in which it has risen or fallen in the tube. Upon these simple principles is the thermometer constructed. It is usually made of a hollow globe of glass, to which is attached a long tube partly filled with mercury, or spirit of wine, this last coloured so as to be seen. The ball is plunged into boiling water, or held over the flame of a candle, which causes the mercury or spirit to ascend to a certain point, the tube is then broken off and hermetically sealed so that no air be in it : a graduated scale placed by the side of the tube completes the instrument. In this country the scale used is that of Fahrenheit, which makes the freezing point of water at 32 degrees above 0°, and the boiling point of the same fluid at 212°. Other thermometers are used in differect parts of Europe. In *Reaumur's*, the freezing point of water is 0°, and the boiling point 80°. In the *Centigrade thermometer* the freezing point of water is 0°, and the boiling point 100°. In *De Lisle's* thermometer the boiling point is 0°, and the freezing point 150°. When a thermometer is intended to measure very low temperatures, spirit of wine is used in its construction, as that fluid has never been frozen. See MERCURY, page 118.

MUSIC AND MUSICAL INSTRUMENTS.

MUSIC, from μουσικα, Gr., *musica*, Lat., that combination of sounds which is agreeable to the ear ; it also implies the science by which such modulations of sounds are regulated ; and, as one of the *fine arts*, it may be defined that which teaches the method of so adapting the voice, or of employing stringed or wind instruments, as to produce agreeable and harmonious sounds.

The early history of music is involved in impenetrable darkness ; we know, however, that it was employed in the most remote ages to soothe, to excite, and to charm ; for this purpose a great number of instruments are mentioned in the Old Testament ; indeed, long be-

* "Water having attained its maximum of density at 40°, if it be cooled below 40° it expands as the temperature diminishes, as it does when heated above 40°. The rate of this expansion is equal for any number of degrees above or below this maximum of density, so that the *bulk* of water at 32° and 48° will be the same."—BRANDE.

This quality of water is of great importance in preserving the lives of fish : ice constantly floating on it.

fore instruments are named, we hear of the *Song of Moses* immediately after the destruction of the Egyptians in the Red sea; and soon afterwards, in Leviticus, the *Trumpet of Jubilee* is mentioned; in Judges too, we find that Jephthah's daughter came out to meet him with timbrels and with dances; and before the reign of David, when he returned from the slaughter of the Philistines (1 Sam. Chap. xviii.) the women came out singing and dancing to meet king Saul, with tabrets, with joy, and with instruments of music. David had also been previously chosen as *a cunning player on the harp* to subdue the evil spirit of Saul.

The *Profane* history of music is not less obscure than that of *sacred.* It is said that music prevailed in Egypt long before it was known in Greece; and this is by no means improbable, as many of the arts were practised in that country before they were exercised in Europe. Music, however, appears natural to man; many of the savage nations with which modern research has made us acquainted, have a sort of rude music in which they express their pleasures and their feelings; but whatever might have been or now is the music of other portions of the globe, there can be no question that, at the present time, music has arrived at its greatest perfection in Europe. The first music was of course that produced by the human voice; although the origin of instrumental music appears to be beyond the period of any authentic history. Mercury is said to be the inventor of the *lyre*, by distending strings of different lengths and diameters upon the shell of a tortoise, thence sometimes called *testudo*, which he found upon the sea-shore. The first exhibition of the *fistula* or shepherd's pipe is attributed to Pan. But these are evidently fables. The Greeks, it appears however, so far improved music, that their scale included more than the compass of a double octave; and such was its perfection, that it remained almost in the same state till the eleventh century, when *Guy d' Arezzo*, *Aretinus* or *Aretin*, made considerable changes in it. He took the six famous syllables *ut, re, mi, fa, sol, la,* which occurred to him on singing the first strophe of the hymn to St. John:

UT queant laxis REsonare fibris
MIra gestorum FAmuli tuorum
SOLve polluti LAbii reatum.
Sancte Joannes.

Finding that the ancients wrote their notes for different sounds upon the same line, he introduced the use of many parallel lines, upon which, and between which, he placed certain round or square points immediately above every syllable of the text, and which thus, by their situation, distinguished at once the low from the high sounds. *Aretinus* invented, besides, the music of many parts, and found that, in making many persons with different voices sing together, he could produce a harmony which charmed both the mind and the ear. To the six syllables of Aretinus a seventh was added by, it is said, a Parisian named *Maire* in the seventeenth century: this syllable is SI.

This is the history of the basis of the modern notation of music, which has undergone from time to time other improvements to bring it to the state in which we now find it.

THE CHARACTERS OF MUSIC. The ancient Greeks used for musical characters the letters of the alphabet; the Latins imitated

them ; but Guy *Aretinus*, as we have stated, introduced the lines, and the *marks*, which we now denominate *notes*. The GAMMUT or *Gamma ut* is a table or scale invented by *Aretinus*, by which the notes of the octave may be properly named and sounded.

Many of the ancients wrote on music; so also have written many of the moderns. Of modern musical composers, whose works will immortalize their names, we may mention *Handel*, *Arne*, *Correlli*, *Tartini*, *Pergolese*, *Haydn*, *Mozart*, *Weber*, and a numerous *et cœteri*, which our limits only prevent us from individually naming.

Of the great powers of harmonious music on the mind, even of the most illiterate and uninformed, no one of the least observation can for a moment doubt. Nor can we disapprove of music either as a relief, or agreeable relaxation from more important and serious pursuits ; but to make music, as is unfortunately too often the case in the present day, the *business*, when it should be only the occasional amusement of life, is a sacrifice of sense to sound of which we cannot approve ; least of all can we approve of that music which consists of *sound* only: that music is unquestionably the best, in which noble and generous sentiments are conveyed in company with the most agreeable, soothing, or animating sounds. We are happy to observe that Dr. CROTCH, whose musical talents are well known, has constantly enforced this truth in his lectures with the zeal of a professor, and the judgment of a philosopher.

APOLLONICON, an instrument of the organ kind, invented by Messrs. Flight and Robson, of London, and exhibited by them for some years past as a curiosity in St. Martin's Lane. See ORGAN below.

ÆOLIAN HARP, a stringed instrument whose sounds are produced by a current of air ; hence its name from *Æolus*, the god of the winds. It consists of catgut strings, usually five or six, distended in parallel lines on a box of wood with a thin top, containing a sound-hole in the centre. The strings are tuned in unison ; and when the instrument is placed in a proper position to receive a current air, (a partially open window is one of the best,) it produces by the tremulous motion given by the air to the strings, a soft, melodious, pleasing, and various combination of sounds. Kircher is the reputed inventor of this instrument ; but it has been since greatly improved.

BAG-PIPE, a well known wind instrument of great antiquity among the northern nations of Europe, and long and still a favourite in Scotland, where it was probably introduced by the Norwegians or Danes. It consists of the bellows or leathern bag to collect and retain the wind, and which is placed under the arm, and operated upon by that limb ; and of three pipes, the longest of which is called the drone. The bag-pipe takes in the compass of three octaves. It does not seem to southern ears an agreeable instrument.

BASSOON, or *Bas son*, low sound, a double bodied wind instrument made of wood, between three and four feet long, with finger holes and keys and a curved brass tube, to which is attached a reed by means of which the sounds are produced, it being blown into by the mouth. It is used as a bass occasionally in concerts ; its sounds are said to assimilate best with the hautboy. Its compass includes three octaves.

BASS VIOL, see CROWTH and VIOLONCELLO.

Of BELLS as musical instruments some notice must be taken.

We have mentioned the casting of bells, and the weights of some of the largest in page 187. Bells are of very ancient use ; we find them among the Jews, Greeks, Romans, Christians, Heathens, and variously applied : on the necks of men, beasts, birds, horses, sheep ; but chiefly in religious buildings, where they are often eight in number, forming an octave, and on which many tunes are played, and almost innumerable *changes* rung. The introduction of church bells into this country was in the ninth century, when they were first brought to the then splendid abbey of Croyland in Lincolnshire. The sound of a bell is generally supposed to consist in a vibratory motion of its parts, much like that of a musical chord ; the stroke of the clapper changing the round figure of the bell to an oval ; and thus giving that tremulous motion to the air in which the sound consists. *Electrical bells* are used in a variety of entertaining experiments by electricians. Small bells are now often introduced in theatrical music.

CASTANET or CASTAGNET ; an instrument used in dancing, consisting formerly of two hollowed *chestnut shells*, whence the name, with loose kernels or hollow balls resembling them. The dancer holding a castanet in each hand, rattles them to the motion of his feet. Castanets can scarcely be called musical instruments. They are now usually made of wood, and not of chestnut shells.

CLARION, a kind of trumpet whose tube is narrower, and tone more shrill than the common trumpet.

CLARINET ; a wind instrument of the reed kind about two feet long with a mouth piece, the scale of which, though it includes every semitone within its extremes, is virtually defective. It however commands in the hands of a good performer more than three octaves. Some additional keys have been lately added to this instrument. It is commonly made of box.

CLAVICHORD ; a stringed instrument, if not invented greatly improved by Euler. It is said to be a good instrument for forming the musical taste by chamber practice, and was much used by composers in their studies. Its construction is ingenious though simple ; but we cannot describe it ; it is however of more force and brilliancy of sound than has been generally attributed to it.

CORNET, a wind instrument which more than a century since was superseded by the hautboy. Cornets were of three kinds, *treble*, *tenor*, and *bass ;* the first two were simple curvilinear tubes about three feet long, and gradually increasing in diameter from the mouth piece to the lower end. The bass cornet was a serpentine tube, increasing in diameter in the same manner. See SERPENT below.

CROWTH or CRUTH, an instrument formerly much used in Wales, somewhat like a violoncello ; it had six strings. It is sometimes called also bass viol. It is now however not used. See VIOLIN and VIOL.

CYMBAL or CYMBALUM, an ancient instrument ; it is said to have been round and made of brass, but its nature and powers are not accurately known. The name cymbal is now commonly given to two metallic discs held one in each hand, and struck against each other ; they are used chiefly in military bands.

Drum, a generic term for different instruments. The *martial* drum is cylindrical, hollow within, and covered at the two ends with vellum ; which is stretched or slackened at pleasure by means of small cords and sliding knots. The vellum being struck with sticks produ-

ces a rumbling sound. The sides of these drums are always made of wood. A large drum held horizontally, when struck at both ends, is called a *bass drum.* *Kettle drums* are large hemispheres of copper, covered with vellum or goat skins, kept fast by a circle of iron with screws, by which means they can be tuned. These kinds of drums are used in the cavalry, and also in operas, oratorios, concerts, &c. Drums are said to be an oriental invention, and to have been brought by the Arabians or Moors into Spain.

DULCIMER, a triangular instrument, consisting of about fifty wires strung upon a bridge at each end; the shortest is usually eighteen inches long, the longest thirty-six. It is performed upon by striking the strings with small iron rods. Dulcimer is also the name given to a musical instrument in the Scriptures of which nothing seems with certainty known.

FIFE, a shrill wind instrument, used chiefly in the army. It is a small tube about a foot long, having holes disposed along the side, and is blown into by the mouth at the side similarly to the German flute. It is commonly made of box.

FLAGEOLET, a small kind of flute, having a mouth-piece and holes for the regulation of its sounds. It is usually made of box or other hard wood. Flageolets are made of various sizes; some are mounted with keys. One lately introduced, called the *double flageolet*, is a very pleasing instrument.

FLUTE, a name applied to several kinds of cylindrical wind instruments of different lengths, diameters, &c.

The *common flute* or *English flute* is about eighteen inches long and one in diameter; it has eight holes for the eight fingers, and the upper end is formed to be applied to the mouth, whence it is blown into to produce its sounds.

The GERMAN FLUTE is a more valuable and important instrument than the common flute, being much longer, consisting of several moveable joints, and is furnished with many keys. It is blown into from the side through a circular hole, similarly to that of the fife. This instrument has been lately much improved; most of the kind have now a telescopic slide, by which they may be tuned.

FRENCH HORN is a circularly wreathed *trumpet*, of which it has similar defects; but these have been lately much palliated: it has a slide by which the instrument may be tuned: it is usually made of brass. The Hebrews made use of rams' horns to proclaim their jubilee; and occasionally in this country the horns of oxen are employed for producing a loud and powerful sound by being blown into. Other horns made of metal, &c. are occasionally used in this country; one, *the bugle-horn* or *hunting-horn*, is well known. Some of these have been lately much improved in their construction and compass by keys, and in consequence are used in orchestral music.

The GONG is an instrument of a circular form, made of brass, which the Asiatics strike with a large wooden mallet; the sounds of the gong have little, if any, music in them; their distinguishing characteristic is loudness.

GUITAR, or GUITARRA, (corrupted probably from *Cithara*, Latin,) is a sort of lute played with the fingers. It consists of six strings; on the neck are various frets made of wire, which guide the fingers to make the several notes. The bridge is low, and stands behind a circular sound-hole; the body is of an oval form, the sides perpendicular

to the belly and the back. The strings are pressed by the fingers of the left hand, and struck by those of the right. The guitar was first used in Spain and Italy. The Spaniards are so fond of it that there is scarcely an artificer who cannot play upon it; the men of almost all orders use it on an evening to serenade their mistresses.

HARP, a stringed instrument of a triangular form. It stands erect, and when used is placed at the feet of the performer, who produces its tones by striking the strings with the thumbs and fingers of both hands. The harp is one of the most ancient of instruments, of which its frequent mention in the Scripture, and the accounts transmitted to us of the *Theban harp*, are sufficient evidences. Etymologists differ much on the origin of the word *harp;* some deriving it from the ARPI, a people of Italy, who, it is said, invented it; others from the Latin *carpo;* others from the German *herp;* while others again say that it comes from the Anglo-Saxon *hearpa.* Certain it is that the Irish and Welsh used the harp long before the gammut of Aretin was invented.

There is some diversity in the structure of harps. That called the triple harp has 97 strings or chords in three rows. The bass row, played with the right hand, has 36 strings; the treble side has 26; and the middle row 35 strings. In this harp each side has a separate string; in the *Welsh harp* there are two strings to each note of the principal scale, and an intermediate row for the semitones. In the *Pedal harp* the half notes are formed by pressing pins against the string, so as to shorten them as regards their sounds. The music of the harp is similar to that of the spinet; but it is capable of much greater perfection than the music of that instrument. It is also very generally agreed that the harp is very different from the *lyra*, *cithara*, or *barbiton* of the Romans.

The *bell-harp* is so called from its being generally swung about in performance like a bell. It is about three feet long; its strings, of no determinate number, are of brass or steel, distended over the sounding board. This instrument includes four octaves; the right hand playing the treble and the left the bass.

HARPSICHORD, a stringed instrument having keys, which are pressed upon after the manner of a pianoforte, the keys being struck down by the fingers with some force, their inclosed extremities raise up little jacks of wood, furnished near the top with projecting crow-quill points, which strike the wires, and thus produce the sounds. Two strings are generally attached to each note, in order to give a fulness of sound. The strings are composed of brass or steel wire. Notwithstanding a good harpsichord is a very pleasing instrument, its use has been nearly superseded by the pianoforte.

HAUTBOY, pronounced *Hóboy*, and sometimes spelled fantastically *oboe*, (from the French, *haut bois*, or high wood,) is a wind instrument of the reed kind, consisting of a tube gradually widening from the top to the lower end; it is furnished with keys, and has circular holes for regulating its sounds. It was named by the French *haut bois*, in contradistinction to bassoon or low wood instrument. The tone of the hautboy is grateful and soothing, and well adapted to express soft and plaintive passages.

HORN. For the several kinds of musical horns, see FRENCH HORN above.

KIT, a small violin, capable of being carried in the pocket. Its usual length is about 16 inches, that of the bow 17. Small as this instrument is, its powers are co-extensive with those of the violin.

LUTE, a stringed instrument, formerly much in use; it at first consisted of only five rows of strings, to which six or more were afterwards added. It has four parts: the table; the body, which has nine or ten sides; the neck, which has as many stops or divisions; and the head or cross, in which the screws for turning it are inserted. In playing it the performer strikes the strings with the fingers of the right hand, and regulates the sounds with those of the left. The origin of this instrument is not known. The name is derived from the French, *luth* or *lut*.

LYRE, one of the most ancient of stringed instruments. Its frame at first consisted of the shell of a fish—the tortoise, hence called *Testudo;* and hence also the *testudo resonare septem callida nervis* of Horace. Concerning the number of its strings there is a variety of opinions. The form of the lyre is best seen in the hands of ancient statues. And from all which can be gathered concerning the strings, it appears that it had sometimes five, sometimes six, but most frequently seven, made of the thongs of raw sheep or goat skins cut extremely fine and twisted. The origin of the lyre is ascribed to Mercury; but so much fable is mixed up with the accounts of this instrument, that it would be idle to dwell upon it. As the body of this instrument was originally formed from the shell of a tortoise, hence the term *shell* has been used figuratively in poetry for any instrument to which the poet might be supposed to sing, whether it were harp, lyre, or lute.

MUSICAL GLASSES, are 37 hemispherical glasses so formed and tuned as to make three octaves with their semitones. They are played upon by sitting down before them as before the keys of a harpsichord. The glasses are occasionally wetted with a sponge and clean water; and the fingers must also be soaked in water and rubbed occasionally with fine chalk to make them catch the glass and bring out the tones more readily. Different parts may be played together by using both hands. Dr. Franklin is the inventor of this instrument, which he called *armonica*. Another instrument made of glass *tubes* instead of hemispheres has been since invented by Dr. Chladni of Gottingen, to which he gave the name of *euphon*. The number of tubes is 42; it is said to be much more simple in construction than the armonica, and in some respects preferable in its sounds to that instrument; but we cannot detail its arrangement.

MUSICAL SNUFF BOXES have a set of elastic metallic teeth, similar to those in a comb, operated upon by a revolving barrel, like that in a barrel organ; the revolution is produced by a concealed spring, and thus many a pleasing tune is played, as it were by a sort of magic.

The ORGAN is one of the largest, grand, and most harmonious of all wind instruments. It is chiefly used for playing a thorough bass with all its accompaniments. The invention of the organ, which is attributed to the Greeks, is very ancient, although it is generally agreed that it was little used till the eighth century. Vitruvius describes one in his tenth book. The Emperor Julian has an epigram in its praise. St. Jerome mentions one with twelve pairs of bellows, which might be heard a thousand paces, or a mile; another at Jeru-

salem, which might be heard at the Mount of Olives. The construction of the modern organ may thus summarily be described. It consists essentially of several rows of pipes of different sizes and lengths. Its size is usually expressed by the length of its largest pipe: thus we say, an organ of 32, of 16, of 8, or of 2 feet. The organ has one set of keys when it has only one body; and two or three when otherwise. Large organs have four, sometimes five, sets of keys. Besides, the pedals, or largest pipes, have their key, the stops or touches of which are played by the feet. The keys of an organ are usually divided into four octaves. The organ has also a wind chest and a pair of bellows, which is worked by a person who attends to that operation alone, and thus all the pipes of the instrument are filled, so that the moment a key is touched, a sound is produced. An organ has also what are called *stops*, that is, different pipes for the production of different sounds; among others it has two or more *diapason* stops, the *clarion*, the *trumpet*, the *cornet*, the *flute*, the *bassoon*, the *vox humana*, the *hautboy*, and *cremona* stops, &c. &c. The fingering of an organ is precisely the same as that of the pianoforte, so far as relates to the situation of the keys, &c. but there is nevertheless considerable difference in the mode in which the notes are produced.

Organs are also made with *barrels* on which are placed a great number of pins and staples of brass; the barrel being turned by means of a crank, the pins and staples operate upon valves, connected with pipes, for a longer or shorter time, and thus produce their music; ten or fifteen tunes are usually set in one barrel organ; the winch not only turning the barrels, but working a pair of bellows at the same time. This instrument is called a *hand* or *barrel organ*, and is very common in the streets of London.

The *hydraulic organ* is one operated upon by water; of these there are several in Italy in the Grotto of Vineyards. Ctesebes of Alexandria, who lived in the time of Ptolemy Evergetes, is said to have invented the hydraulic organ, of which Archimedes and Vitruvius have left us descriptions.

The most complete organ yet invented is supposed to be that of Messrs. FLIGHT and ROBSON of St. Martin's Lane, London; besides many other improvements it is so contrived as to serve both for a finger keyed organ and a barrel organ. It has been named by its inventors APOLLONICON. But we cannot enter into a description of it.

PANDEAN PIPES or *mouth organ* is frequently played as an accompaniment to other music in the streets. This instrument consists of a range of pipes bound together side by side, gradually lessening with respect to one another in diameter, and shortening in length. The longest is about six and the shortest about two inches in length. Their sounds are similar to very clear and spirited whistles. This is the *syrinx* or *fistula* Theocritus, Lucretius, and Virgil.

PIANO-FORTE, from *piano*, soft, and *forte*, loud or strong, in the Italian language, a well known stringed instrument, having various forms, the most common of which is that of the parallelogram. Piano-fortes are distinguished into *common*, *cabinet*, and *grand*. In this instrument the sound is produced by the blow of a hammer raised by a lever, which is as much detached from it as possible. The *grand piano* is generally like the harpsichord in form, although sometimes the cabinet shape; but its action and tone are much superior. Most

grand pianos have two pedals, one for each foot, communicating with the interior; these add to or diminish, by machinery within, the sounds of the instrument at the pleasure of the player. The *common* piano-forte is very different in form from the grand; but its action and movements are similar. The *upright* or *cabinet* piano-forte is, in its appearance at least, a much more elegant instrument than either of the preceding; this form of the piano, as a piece of furniture, seems now to be very generally preferred. In concerts, however, the horizontal grand piano is still used.

It should also be mentioned, that piano-fortes have been lately constructed so as to be *self-acting* by means of machinery, the chief of which consists of a barrel similiar to that of the barrel of an organ.

The strings for the higher notes are made of brass, those for the lowest notes are of copper.

This instrument was invented by our English poet MASON, the author of Caractacus, &c.; and although of such recent origin, it has since received from Englishmen and Foreigners many useful improvements; and is generally considered one of the most elegant and noble in the whole compass of musical intonation.

PIPE; see TABOR.

PSALTERY; an instrument much used by the ancient Hebrews, who called it *nebel;* but of this little or nothing is known. The psaltery now in use is flat in form of a trapezium, or triangle truncated at top; it is strung with thirteen wire chords, set to unison or octave, and mounted on two bridges on the sides; it is struck with an iron rod, sometimes with a crooked stick. Its body resembles a spinet.

SACBUT; a bass wind instrument resembling the trumpet, so contrived as to be drawn out to different lengths, according to the acuteness and gravity of the scale required. It is usually about eight feet long; when extended to its full length, about fifteen. The wreath is two feet nine inches in circumference. Sacbuts are, however, of different sizes. Concerning the sacbut of the Hebrews nothing is with certainty known.

SERPENT; a bass wind instrument, named from its serpentine form; is usually covered with leather. It has three distinct parts—a mouth-piece, neck, and tail; and six circular apertures for the modulation of its notes; it was formerly used as a base to the cornet.

SPINET, (from *spinetum*, Lat. a bush of thorns, because its quills resemble thorns,) a stringed instrument apparently derived from the harp, and superseded by the harpsichord, which is an improvement on it.

TABOR, TABOUR, or TABRET; a small drum, so flat that the two heads are not more than three inches apart; usually an accompaniment to the pipe. They are both played by the same performer; while the tones of the pipe are regulated by the fingers of the left hand, the tabor is beaten by the right. The tabor and pipe have long been favourite instruments with the common people of most of the countries of Europe, and are particularly calculated for dancing parties; they are, however, not much used in this country.

TAMBOURINE, or TAMBOUR; a kind of semi-drum, in the shape of a sieve, mounted in the sides with small bells, and loose pieces of tin. It is agitated in various ways with the hand. It was formerly considered as a *tinkling cymbal.*

TIMBREL; an instrument played by pulsation; some have con-

sidered it a sort of tambourine; it is mentioned in the Scriptures, but very little seems to be known concerning it.

TRIANGLE; a steel instrument, so called from its consisting of a bar of polished steel, formed into a triangle; it is struck with a steel rod, and yields a shrill gingling sound.

TRUMPET, (*trompette*, French,) or TRUMP, the loudest of all portable wind instruments; it is used chiefly in the cavalry to direct them in the service. The ancients had various instruments of the trumpet kind; as the *tuba*, *cornu*, *lituus*. The modern trumpet consists of a *mouth-piece*, nearly an inch across; the pieces which conduct the wind are called the *branches*; the parts in which it is bent the *potences*, and the canal between the second bend and the extremity, the *pavilion*; the rings where the branches take apart, or are soldered together, *knots*, which are five in number, and serve to cover the joints. It is usually made of brass. When well managed, its sound is of great compass, but, like the horn, it only commands certain notes. A good breath will carry it four octaves.

The TRUMPET MARINE, or MARIGNY, is a stringed instrument, invented by an Italian artist named *Marigni*, and called a trumpet, because it takes only the notes of the trumpet, with all its omissions and imperfections, and can therefore execute only such melodies as are fitted for that instrument. It is a kind of monochord, consisting of three tables, which form its triangular body. It has a long narrow neck, with one thick string mounted on a bridge, which is firm on one side, and tremulous on the other. It is struck by a bow with the right hand, while the thumb of the left is pressed on the string. The peculiarity of its sound, which resembles that of the trumpet, is produced by the tremulation of the bridge, whence it has obtained its name.

TROMBONE, or TROMBONO, a wind instrument of the trumpet kind, of which there are three descriptions, the *bass*, the *tenor*, and the *alto*. It is a powerful instrument, and used with great effect in grand chorusses, &c. See Sacbut.

VIOL; a stringed instrument, resembling in shape and tone the violin, of which it was the origin. It consisted of five or six strings, the tones of which were regulated by their being brought by the fingers into contact with the frets with which the neck was furnished. The viol was for a long time in such esteem as to dispute the preëminence with the harp. Since it has been reduced to four strings, and stripped of the frets, with which all viols were furnished till the sixteenth century, it still holds the first place among treble instruments, under the denomination of

VIOLIN, or FIDDLE. During the puritanical times of Cromwell, the use of violins was superseded by that of the viol; but after the Restoration violins were again introduced, and the viol consigned to neglect. The antiquity of the violin has been a subject of dispute, as it is generally supposed that no instrument played with a bow was known to the ancients. The *viola* is a tenor violin; the *kit* has been mentioned under that name, which see.

The *violoncello* is a *bass* violin, called sometimes *bass viol*. The *violono* is a double bass violin, and in pitch an octave below the violoncello. The variety of violins is, however, great.

Violin strings were formerly obtained from Italy and Germany; but latterly they have been made in England.

VOX HUMANE, or Vox Humana, a wind instrument of the flute kind, so called from its sounds approaching those of the human voice.

Poetry and Poetical Terms.

POETRY; the language of passion, or of enlivened imagination, arranged most commonly into measured portions of speech, usually termed numbers. Poetry is nearly as ancient as man himself: for we can scarcely conceive any state of social existence in which poetry would not be demonstrated by him in some way or another; either in the hyperboles of encomium, of disdain, of hope, of fear, of pleasure, or of pain. We shall hence infer, that imagination is an essential characteristic of poetry. And although poetry is commonly conveyed in measured language, such as that of the *Iliad* of Homer, the *Æneid* of Virgil, or the *Paradise Lost* of Milton, yet it is nevertheless true, that poetry, and that of the first and most exalted kind too, may be found in language not arranged in such symmetrical proportions. The poetry of Ossian is of this kind; and he who can read the *Address to the Sun*, by that poet, beginning, "O thou that rollest above, round as the shield of my fathers," &c. without emotion, and without feeling that such an address is genuine poetry, is not likely to be convinced by any thing which we can say to him.

However, although genuine poetry consists more in the thought than in the manner in which it is expressed, yet it is nevertheless true, that most of our imaginative writers have chosen to express such thoughts in measured verse, and as such, poetry has usually been considered one of the fine arts. But so much has poetry been deemed a gift or endowment, not to be acquired by any art or instruction, that a very common adage has been long since current, *Poeta nascitur non fit*, implying, that the poet is born, and not made. Now, notwithstanding, certainly, a lively and fertile imagination is essential in a poet, it is nevertheless true, that much may be accomplished by discipline and care. Hence the treatises, not a few, which have been written on this enchanting art; and although it is not possible to make one, not naturally adapted for a poet, a poet, yet there can be no doubt that attentive observation will very materially improve the natural capabilities. Horace is one of the ancients who has given us his *recipe*, in his *De Arte Poetica*, for the construction of poetry; many of the moderns have followed his example. In one sentiment of his we entirely concur.

Scribendi recti, sapere est principium et fons.

And sure we are, that without knowledge, and extensive knowledge too, no one ever can be a good poet.

The ancients, as well as moderns, have distinguished the *measures* of poetry into various kinds. On the *hexameters* and other measures of the Greek and Roman writers we cannot enlarge; but we may just add of English versification, that it consists either of *rhyme* or of *blank verse;* the first is where a sound or sounds, similar, but not identical to those which terminate the preceding line is heard, thus:

"War he sung is noise and *trouble*,
Honour but an empty *bubble*."

DRYDEN.

Or, where Lord BYRON speaks of BUONAPARTE,

"But where is he the champion and the *child*
Of all that's great or little, wise or *wild*:
Whose game was empires, and whose stakes were *thrones*;
Whose table earth, whose dice were human *bones*?"

In *blank* verse, on the contrary, no similarity of termination in the line is heard; thus SOUTHEY:

"From the ties of life
Unnaturally rent, a man who knew
No resting place, no dear delights of home,
Belike who never saw his children's face,
Whose children knew no father, he is gone,
Dropt from existence like the wither'd leaf
That from the summer tree is swept away,
Its loss unseen."

SOLDIER'S FUNERAL.

English versification consists also of various measures, composed of what are termed *feet*; thus we have the *Iambic*, the *Trochee*, the *Anapæst*, the *Dactyl*, the *Spondee*, &c. The Iambic consists of two syllables, the first short, the last long: most of the feet in the following lines are Iambics, if read without regard to the niceties of the sense; but read with an emphasis on the word *thy* before riot and reason, the two feet, instead of being Iambics, will be *Spondees*: thus, thȳ rī | ot | thȳ reā | son.

"Thĕ lāmb | thy rī | ŏt doōms | tŏ bleēd | tŏ dāy;
Hăd hē | thy reā | sŏn wōuld | he skĭp | ănd plāy?"

POPE.

The *Trochee* consists also of two syllables, but the first is long and the second short, thus:

"Sōftly | swēet ĭn | Lȳdĭan | meāsŭres,
Sōon hĕ | sōoth'd hĭs | soūl to | pleāsŭres."

DRYDEN.

The *Anapæst* consists of two short syllables, and one long one, thus:

"Fŏr thĕ Gŏd | hăd nŏ soōn | ĕr dĕtēr | mĭn'd thĕ fāre,
Thăn ĭt tūrn'd | tŏ whăt ēv | ĕr wăs rā | cy ănd rāre."

HUNT.

The *Dactyl* consists of one long syllable, and two short ones, thus:

> " Weāry wăy̆ | wāndĕrĕr | lānguĭd ănd | sād ăt heărt;
> Trāvĕllĭng | paīnfŭlly | ōvĕr thĕ | rūggĕd roăd,
> Wīld vīsagĕd | wāndĕrĕr | āh! fŏr thy | heāvy chănce."
>
> SOUTHEY.

The *Spondee* consists of two long syllables; but we have no verses in our language composed wholly of spondees:

> " Roūnd brō | ken columns clasping ivy twin'd;
> O'ēr heāps | of ruin stalk'd the stately hind."

It should be observed, that although such syllables as prōne, stōne, &c., are manifestly longer than even the accented ones in *bit'*ter, *tit'*ter, &c., yet, in scanning English verse, they are usually considered as equivalent. We may just mention, that this mark ˘ denotes a short, and this – a long syllable, as will be seen above.

What is called *heroic* verse is composed generally of iambics, interspersed occasionally with spondees, and more rarely with anapæsts; such is the versification of Paradise Lost, and most of that of Pope and Dryden, &c. Some other feet not noticed above, will be occasionally found in our poetry, but it is not necessary that we should name them. The fashion prevalent in Pope's time, of reducing every line of heroic verse to *ten* syllables was bad, and is now departed from; the silly practice too of eliding the vowels from such words as *the*, *glittering*, and many others, is now generally exploded: for, in reading poetry, it is scarcely possible to avoid sounding the *e* in the; and cacophonous to compress glittering thus (glitt'ring) into two syllables.

From the preceding feet, therefore, are nearly all our varieties of English versification composed. Some new measures besides those commonly in use, have been attempted, such are the dactyls of Southey above quoted, but the examples have been little followed. One, however, first introduced by Lewis in *Alonzo and Imogen*, and since by Southey, in the *Maid of the Inn*, consisting of anapæsts, disposed in stanzas of five lines each, has obtained notice; but we cannot give a specimen of it.

We must add, in concluding this article, that poetry, when employed in conveying and enforcing truth, demands attention and respect; and we have no doubt, with proper care, might be rendered much more beneficial and useful to mankind than it hitherto has been: but when it is employed, as it now unfortunately too often is, in virulent satire, and to gratify malignant and improper passions, the mischiefs which it produces are incalculable. He who ministers to the bad feelings and bad tastes of mankind, how brilliant socver his talents as a poet, must never aspire to the dignity of a good man.

The galaxy of modern poetry is embellished with almost innumerable stars of various brightness and magnitude. Many LADIES, more than heretofore, have not disdained to enter the lists for the palm. It is almost invidious to select names, but Mrs. HEMANS, Miss LANDON, Miss MITFORD, and Miss BAILLIE, may be particularly mentioned. Of our own sex, Lord BYRON *was*, a short time since, the Goliah of Poets; his notes still continue to vibrate strongly on our

recollections. Sir WALTER SCOTT, SOUTHEY, COLERIDGE, MOORE, WADSWORTH, CAMPBELL, BOWLES, MONTGOMERY, EDWIN ATHERSTONE, WATTS, BERNARD BARTON, &c. &c. yet live to excite and to charm us. May they all, like JAMES THOMSON, *never write one line which dying they would wish to blot.*

The chief KINDS of POETRY are the following :—

EPIC POETRY is that poetry in which some signal and important transactions performed by some hero or heroes are described. An Epic Poem, called also *epopeia*, or *epopee*, is such as the *Iliad* and *Odyssey* of HOMER, the *Æneid* of VIRGIL, the *Jerusalem* of TASSO, the *Paradise Lost* of MILTON, *Joan of Arc* of SOUTHEY, &c. An Epic poem ought always to be instructive as well as pleasing ; to improve the manners and enlarge the mind, as well as to excite, entertain, and surprise.

DIDACTIC POETRY is that which gives precepts for the practice of some particular art or science ; and also directions and advice on many other occasions. The *Art of preserving Health*, by ARMSTRONG, is a didactic poem. Pope's *Essay* on *Criticism*, on *Man*, and his *Moral Epistles*, are didactic poems.

DESCRIPTIVE POETRY, *describes* various phenomena, the country, woods, mountains, torrents, the sea, animals, and numerous occurrences ; it may be divided into two kinds ; one of which is employed in describing natural objects, such as THOMSON'S SEASONS ; the other unfolds or paints the operations of the mind : both are often united. In the last class is AKENSIDE'S *Pleasures of Imagination ;* of the same kind are also ROGERS'S *Pleasures of Memory*, and CAMPBELL'S *Pleasures of Hope.* POPE'S *Windsor Forest* is also a descriptive poem.

PASTORAL POETRY, that which is used by shepherds, or that which treats chiefly of rural affairs and a shepherd's life. Theocritus, Virgil, Pope, Collins, Shenstone, Cunningham, and Bloomfield, are pastoral poets. The poetry of the last, perhaps, approaches the nearest to what is generally considered the genuine pastoral.

LYRIC POETRY is that usually composed to be set to some music or to be accompanied with music. Such are *Psalms*, *Hymns*, *Odes*, *Songs*. The ode is by far the most dignified of these. Among the ancients, *Pindar* was one of the most eminent lyric poets, full of force and fire ; hence an ode, formed in imitation of his manner, is called PINDARIC. Pindar was born at Thebes, and flourished about 478 years before Christ. We have many modern lyric poets ; such as *Cowley*, *Dryden*, *Mason*, *Gray*, *Collins*, &c. ; in songs too, the moderns have written elegantly—Lord *Byron*, *T. Moore*, &c.

The *ode* of the ancients was divided into three parts ; the first was named *strophe*, the second *antistrophe*, and the last, *epode*, which was sung by the priest at the altar, after all the turns and returns of the strophe and antistrophe ; the term epode then signified the end of the song. The ancient odes are generally in honour of the gods ; our English odes, in praise of heroes and great exploits : the character of an ode is sweetness and sublimity.

SATIRIC POETRY is that which is employed chiefly in reproving the vices, errors, and follies of mankind in a pungent and taunting manner, so as to render the vice or folly ridiculous. Horace and Juvenal among the ancients, and Dryden, Boileau, Pope, Young, and many others among the moderns, have written satires. It is scarcely possible to read those of the eminent poets named, without being

highly excited, and, on numerous occasions, very much pleased; but it may be questioned, nevertheless, whether satire either poetically or otherwise written, be the best mode of correcting mankind of their vices, errors, or follies. A disposition for satirical wit and smart repartee in the young, in particular, ought not to be encouraged; it is very often offensive at once to the feelings and to good manners.

DRAMATIC POETRY is usually considered the highest kind of poetic effort. It consists in a composition of such language as is suitable to persons placed in striking and extraordinary situations in real life; and the nearer such writing expresses the actual situation and feelings of such persons, the more successful is the dramatic poet considered. The plays of Shakspeare will for ever remain, although mixed with much improper matter, splendid monuments of his genius as a dramatic writer. The ancients too excelled in dramatic writings; witness those of Euripides, of Æschylus, and Terence. Besides Shakspeare, our own dramatic writers are almost innumerable.

FIGURES are the life and soul of poetry; without figures, speech and writing, even prose, would be comparatively tame and insipid; indeed, so much is figure mixed with language generally, that few common sentences are without it. By figure is implied the use of words or expressions in a different meaning from their obvious, common, and simple ones. Thus, we say a child is a *sweet* child, or the day is a *beautiful* day; here the words *sweet* and *beautiful* are figures; the lowest kind it is true: we call them *tropes*. *Comparison*, or *simile*, is another very common figure; *thy wife shall be like a fruitful vine;* in this and similar sentences, by merely omitting the word *like*, the figure becomes a *metaphor;* metaphors are indeed most prolific sources of beauty in poetry. In the lines quoted above of Lord Byron's, relative to Buonaparte, are four striking metaphors :—

> Whose game was, *Empires*, and whose stakes were, *thrones;*
> Whose table, *Earth*, whose dice were, *human bones.*

All our first poets abound in this figure; the Scriptures and Ossian are full of it. *Personification* is that figure in which we attribute life and action to inanimate objects. The *apostrophe* consists in addressing some real or imaginary personage. *Alliteration* is a repetition of the same letter or syllable twice or more in the same line. *Hyperbole*, or exaggeration, consists in expressing objects and emotions greatly beyond the truth. There are many other figures used both in poetry and prose, but we cannot enumerate them.

A *verse* in poetry is generally considered one line, whether long or short. A *stanza* consists of many lines; the stanza of nine lines, in which Spenser wrote his *Faery Queen*, Thomson his *Castle of Indolence*, Beattie the *Minstrel*, and Lord Byron his *Childe Harold*, is one of the most esteemed. The word stanza is Italian, and signifies a stand or station. Most of the Italian poems are divided into stanzas.

A SONNET is a short poem consisting of fourteen lines; it was invented by Petrarch, the Italian poet, who lived in the 14th century; he wrote some beautiful sonnets. A sonnet generally consists in the amplification of one striking thought. Our writers of sonnets are numerous: Donne, Daniel, Drummond, Milton, Warton, Mrs. Smith, Bowles, Southey, Coleridge, &c.

MADRIGAL, a small poetic piece, generally amatory, not con-

fined however to the scrupulous regularity of a sonnet, nor to the acuteness of the epigram, but consisting of some tender, delicate, yet simple thought, suitably expressed. While the EPIGRAM consists essentially of one thought ending in a point of wit at once lively, piquant, and ingenious, the characteristics of the madrigal are tenderness and beauty. The Italian and French songs and airs are often of the madrigal kind.

EPITAPH, a monumental inscription sometimes in poetry, sometimes in prose, and sometimes consisting of both, in honour or memory of the dead. The epitaphs written by Pope for several celebrated persons are well known; perhaps one of the finest epitaphs in the English language is that on a monument in Bristol Cathedral to the memory of Mrs. Mason, and written by her husband, the poet MASON.

ECLOGUE, a pastoral poem in which shepherds are introduced as conversing together. See PASTORAL POETRY above. Among the ancients, certain prose compositions were termed eclogues; as those of Diodorus, Polybius, Ctesias, Theophrastus, Strabo, &c.; but here the term eclogue implies only extract or collection. Many of our poetical eclogues are pleasing, not because they exactly suit the life of a shepherd, but rather because they possess tenderness and elegance. Bloomfield's poetry approaches the nearest to the real pastoral of any with which we are acquainted.

ELEGIAC Poetry is that employed on solemn or mournful occasions. We have one stanza which is more particularly employed in this kind of poetry; it is that in which the well known Elegy of Gray, written in a country church-yard, is composed; it consists of four lines, with alternate rhymes, and in heroic verse.

PROLOGUE, in dramatic poetry, an explanatory exordium addressed to the audience before the drama begins. Among the ancients, the prologue was a part of the piece; but with us it is not so: with them the drama was opened with the prologue; with us it is not opened till after the prologue is delivered.

EPILOGUE, in the drama, is usually a poetical address to the audience when the play is completed. It also implies the last part of a discourse or treatise containing, generally, a recapitulation of the principal matters delivered.

IDYL, or *Idyllion*, a little pastoral poem, describing in a lively manner some adventure or things. Theocritus first wrote idyls; the Italians imitated him: Gesner, a celebrated German, has also written idyls, which have been much admired.

VAUDEVILLE, or *Vaudevil*, a kind of song or ballad composed in couplets, and treating persons and things in a jocose or satirical way. It originated in France in the 15th century.

DITHYRAMBUS, in ancient poetry, a hymn in honour of Bacchus, full of transport and poetical rage; verses in which none of the common measures or rules are observed. Among the moderns, the term DITHYRAMBICS is applied to wild yet spirited verses composed in praise of wine, &c.

ACROSTIC, a poetical composition in which the initial letters of the lines being taken, they form the name of some person, place, kingdom, motto, &c. Acrostics are considered the lowest kind of poetical writing; they were formerly in more repute.

CAROL, from *Carola*, Italian, a song of joy and exultation; it is now only applied in this country to the songs of exultation circulated

among the vulgar at Christmas, hence called *Christmas carols.* When they were first used in this country we do not know; but prior, certainly, to the year 1621.

Mythology, the Muses, Taste, Belles Lettres, Literary Terms, Rhetoric, Eloquence.

The transition from Poetry to Fable, and hence to

MYTHOLOGY, will be in perfect accordance with the objects which this portion of our work comprises. Mythology implies a discourse concerning fable, but in its more usual acceptation it is a history of the fabulous Gods, Goddesses, Heroes, and other persons of antiquity, and more especially those with which the writings of Greek and Roman authors are so thickly bestrown.

In pagan antiquity there were three different religions. The *first* was that of the philosophers, who treated metaphysically of the nature, attributes, and works of the Supreme Being. The *second* was that of paganism, which was the established religion of all civilized nations except the Jews. Its doctrines were taught by the priests and protected by the sovereigns; and although those doctrines were false, they were not always so absurd as they may at first appear: for they were frequently understood in a mystic, and always in an allegoric sense. The first heathens deified their great men, such as Jupiter, Apollo, Bacchus, Hercules, &c. in order to induce others in after ages to reverence and imitate them. The *third* religion was idolatry, the religion of the populace: for the common people, unfortunately too often deceived, confounding the statues of their gods, &c. with the gods themselves, adored them, and proceeded to the most ridiculous excesses and extravagances in ceremonies, feasts, libations, and sacrifices. It appears, however, as far as can be ascertained, that the more intelligent pagans did adore one sovereign lord of the universe under the name of *Fate* or *Destiny;* which we must not confound with *Fortune*, who was considered a subaltern divinity. Jupiter himself, all the gods, and every animated being, the heavens, the earth, all nature were subservient to *Destiny*, and nothing could reverse its decrees.

After this general idea of the Supreme Being comes the positive religion of the Pagans, founded wholly on fable, moral fictions, ancient tradition, and historical events altered in a variety of ways by superstition, by the poets, or by the credulity of the people.

The books on the *Heathen Deities*, class them under Celestial *Gods* and *Goddesses;* such are *Jupiter*, *Juno*, *Apollo*, *Minerva*, *Venus*, &c.; Terrestrial, as *Saturn*, *Janus*, *Œolus*, *Vesta*, *Cybele*, *Ceres*, &c.; of the Sea, as *Neptune*, *Tritons*, *Oceanus*, *Sirens*, &c.; and of Infernal Deities, as *Pluto*, *Proserpine*, *the Fates*, *the Furies*, *Night*, *Death*, *Minus*, *Rhadamanthus*, &c. Fabulous as the accounts of such imaginary beings are, no one having any pretensions to ancient learning ought to be ignorant of them, as it is quite impossible to understand classic authors, and more especially the poets, without some acquaintance with such fable.

ELYSIUM, or Elysii Campi, the *Elysian Fields*, in the Greek and Roman mythology, a place or island in the infernal regions, where the souls of the virtuous were placed after death, and where, amidst

bowers for ever green, delightful meadows, and pleasant streams, with birds warbling continually in the groves, they enjoyed complete happiness. The term *Elysium* is usually applied to a place of exquisite happiness. Virgil gives fine descriptions of the Elysian Fields; he also opposes Elysium to TARTARUS, another infernal region, where the most impious and guilty amongst mankind were punished.

ORACLE (*Oraculum*) in the history of ancient superstition and imposture, an answer of the gods to the questions of men, or the place where their answer was given. There were oracles in Egypt, Greece, and Rome. The most celebrated oracles of antiquity were those of *Dodona*, *Delphi*, *Jupiter*, *Ammon*, &c. Delphi was, however, the most famous. The answers were given in various ways; sometimes by a priest; at Delphi always by a priestess called *Pythia*.

The MUSES were the feigned daughters of Jupiter and Mnemosyne, the goddess of memory; they resided over the feasts and solemnities of the gods, and were the reputed goddesses of the several arts and sciences. They were the companions of Apollo, and inhabited with him chiefly the hills Parnassus, Helicon, and Pindus. Hippocrene and other fountains at the foot of Parnassus were sacred to them; as were also the palm tree and laurel. They are represented young, and very handsome, and are nine in number. *Clio*, said to be the chief muse, derives her name from glory and renown. She presided over history, and is said to be the inventress of the lute. *Calliope*, so called from the sweetness of her voice, presided over eloquence and heroic poesy. *Erato*, or the lovely, presided over lyric poetry. *Thalia*, from the gaiety and pleasantry of her songs called the Flourishing Maid, invented comedy and geometry. *Melpomene*, the muse of that age, presided over tragedy and melancholy subjects. *Terpsichore*, or the jovial, presided over music and dancing. *Euterpe*, so called because she imparts joy, invented the flute, and presided over music; she is also said to be the patroness of logic. *Polyphymnia*, so called from the multiplicity of songs, is said to excel in memory, and presided over rhetoric. *Urania*, or the celestial Muse, presided over divine poesy, and is said to be the inventress of astronomy.

The GRACES, called also *Charities*, in the heathen mythology, are three nymphs or deities, named *Aglia*, *Thalia*, and *Euphrosyne*, (i. e. shining, flourishing, and gay,) who attended on Venus.

The VIRTUES, in heathen mythology, are *Faith*, *Hope*, *Justice*, *Piety*, *Mercy*, *Clemency*, *Chastity*, *Truth*, *Mens*, or understanding, *Concord*, *Peace*, *Health*, *Fidelity*, &c. The *Cardinal Virtues* (now commonly so called) are *Justice*, *Prudence*, *Temperance*, and *Fortitude;* they are called *cardinal*, from *cardo*, a hinge, because on these four virtues hinge or depend all the rest.

GRACE, or GRACEFULNESS, is an agreeable attribute—the noblest part of beauty. Grace often depends on something very incidental in a fine face; and, in actions, it consists more in the manner of doing things than in the things themselves. Grace in writing is of a congenial kind; it is very similar to elegance.

TASTE, in a figurative sense, is that state or disposition of the mind by which we perceive and enjoy whatever is beautiful or sublime in the works of nature or art. Whatever may be our natural taste for particular pursuits or objects, it is clear that it may be much improved by culture; hence the imperious necessity of educa-

tion to improve our taste for all that is great, good, useful, and true. He who has no taste for pursuits of the most praiseworthy kind, will often behold objects connected with them with apathy or indifference; thus, a flower, or a plant, the sea, nature in all her various forms and appearances; the exquisite works of art to a person of taste, and especially of a cultivated taste, afford objects of unceasing occupation and delight; while to him whose taste has not been excited, whose attention has not been turned to such things, they appear stale, flat, and unprofitable. The cultivation of our taste is therefore an essential in all education, and cannot be too strenuously enforced: the fountains of taste are inexhaustible; and he who can command them, will find them an everlasting source of amusement and delight.

The term BELLES LETTRES, pronounced *Bel-la-tur*, or POLITE LITERATURE, has been introduced into our language from the French. It is nevertheless a very indefinite one: for even Dr. Blair, who wrote professedly upon the *Belles Lettres*, intitled his work *Lectures on Rhetoric and the Belles Lettres;* whereas *rhetoric* is usually considered a branch of Polite Literature. The immediately preceding portions of our work, *music*, *poetry*, &c., are unquestionably branches of the *Belles Lettres*, and yet Dr. Blair, except incidentally, does not treat of *music* in his lectures at all. Some persons have even included mathematics in the Belles Lettres, but surely without reason. Without adopting Dr. Blair's example, we may however adopt, in some measure, his definition. The *Belles Lettres* are conversant with those powers of taste and imagination which tend to embellish the mind, and supply us with amusing and rational entertainment. They open a field of investigation peculiar to themselves. All that relates to beauty, harmony, grandeur, and elegance—all that can soothe the mind, gratify the fancy, or move the affections—belong to their province. Such studies have their peculiar advantage; they exercise our reason without fatiguing it; they lead to inquiries acute, but not painful; profound, but not dry or abstruse; and strew flowers in the path of science. He who is so happy, as to have acquired a relish for such knowledge, has always at hand an innocent, an irreproachable amusement for his leisure hours, to save him from the danger of pernicious passions. To be devoid of all relish for the *Belles Lettres*, is an unpromising symptom of youth, and raises suspicions of their being prone to low gratifications, and that they will sink, in manhood, into that mass of ignorance, apathy, and common place, too often the misfortune of those whose education has been neglected, and whoss tastes are depraved. See PHILOLOGY, page 323.

An ANAGRAM is a transposition of the letters of some name, word or words, by which a new name or words are formed. Thus, the anagram of Galenus is *angelus:* that of Loraine, *alerion*, on which account it was, that the family of Loraine took alerions for their armoury. Calvin calls himself *Alcuinus*, which is the anagram of Calvinus. Anagrams are sometimes made out of several words; such as that on the question put by Pilate to our Saviour, *Quid est veritas?* of which we have this admirable anagrammatic answer: *Est vir qui adest*—The man who is present. The Cabbalists, among the Jews, are professed anagrammatists. Lewis XIII retained Thomas Billon, who was a celebrated anagrammatist, with a pension of 1,200 livres.

An APOPHTHEGM is a short sententious and instructive remark; as that of Augustus, *festina lente:* make haste slowly.

An APHORISM is a maxim, precept, or principle of a science, comprehending much in few words. The term is chiefly used in law and medicine: thus we say the aphorisms of Hippocrates, Boerhaave, &c.; the aphorisms of the civil law.

AXIOM or AXIOMA, a self evident truth: as *the whole is greater than a part; four are more than three*; *from nothing, nothing can arise*, &c. Axiom is also an established principle in some art or science. Thus it is an axiom in physics that nature does nothing in vain; that effects are proportional to their causes, &c.

EMBLEM is a kind of painted enigma which, representing some obvious history, with reflections beneath, instructs us in some moral truth or other knowledge; such is that very significant image of Scævola, holding in his hand the fire, with the words, *agere et pati fortiter Romanum est:* to do and suffer courageously is Roman. The emblems of *Alciatus* (an Italian, born in the 15th century) have been in as much reputation among the learned as those of *Quarles* are among the vulgar in our own country.

An ÆNIGMA denotes any dark saying, in which some known thing is concealed in obscure language. The popular name is *riddle.* Ænigmas, either in prose or verse, have been used in almost all ages and countries. Egypt was noted for ænigmas; in the scriptures too they are occasionally found. An ænigma written, it is said, by Lord Byron, beginning "It is mentioned in Heaven and whispered in Hell," containing numerous words with the letter H in them, has been often quoted; it is, we suppose, quite as good as most ænigmas; but we are no advocates for such ænigmatical writing.

The REBUS is an enigmatical representation of some name, &c. by using figures or pictures instead of words, or parts of words. It is ascribed to the priests of Picardy, who anciently, in Carnival time, used every year to make certain libels, entitled, *de rebus quæ geruntur*, being railleries on the intrigues and transactions of the city, in which they made great use of equivoques and allusions, breaking and joining words and supplying them with paintings. Camden says that the rebus was in great esteem among our forefathers, and that they learnt it from the French in the time of Henry III. The reputation of the rebus is now extremely low; some other enigmatical puzzles have been lately adopted, such as the *charade*, &c., which, although more fashionable, do not seem more deserving attention than the rebus itself; all appear to be the offspring of trifling, folly, or conceit.

EPITOME, is an abridgment or reduction of a large book into a small compass, and in which also the principal and essential parts of such book are comprised.

In concluding this sub-section of our work, a word or two concerning *rhetoric* and *eloquence*, of which we have not before spoken, may be here interposed.

RHETORIC has been usually defined, the art of speaking copiously on any subject with beauty and force. This definiton will apply almost equally well to eloquence or oratory, as to rhetoric; yet the schools have always treated the two somewhat differently: for, in teaching what is called the *art of rhetoric*, a great variety of figures are named and described, such are *metaphor*, *metonymy*, *synecdoche*,

irony, catachresis, hyperbole, metalepsis, allegory, antonomasia, &c. &c. and indeed the terms *rhetoric* and *rhetorician* are now often understood as implying something more artful than natural.

ELOQUENCE or ORATORY, on the contrary, is never understood in such a sense; it may therefore be defined the art or act of speaking with fluency, elegance, and effect, so as to impress the hearer with just ideas of the subject concerning which we desire to excite his attention. Correct speaking, or the choosing and adapting of words and sentences to the things or sentiments to be expressed, ought to be studied by every one desirous of communicating his thoughts to others. If, to the choice of words and sentences be added, such a pronunciation and emphasis, accompanied with those movements of the body and the change of countenance and voice, as the different passions are known naturally and commonly to excite, and which are best calculated to excite and persuade others, the speaker is said to be *eloquent:* persuasion or conviction of the understanding is, therefore, one of the first objects of eloquence. And to this end we may repeat again here, with a trifling alteration, the precept of Horace quoted under *Poetry*, page 369.

"*Loquendi* recti, sapere est principium et fons;"

extensive knowledge of the subject about which we speak being essential to the completion of the orator. It is true long habit and much practice will enable men, with good natural powers, to become adroit debaters, but *knowledge* only can make them eloquent orators—capable at once of persuading and convincing.

PHILOSOPHY AND PHILOSOPHERS.

Although in the preceding parts of our work we have described many branches of philosophy, it may be convenient here to mention a few things and persons which could not be conveniently noticed in any other way.

The term *philosopher* originated with Pythagoras, who refused the title of *sophos*, wise, given to his predecessors, Thales, Pherecydes, &c. as too assuming; and he, therefore, took the name of *philos sophou*, a friend or lover of the wise: hence the terms philosopher and philosophy. A philosopher may be defined one who knows, as far as they can be known, the nature and causes of all things, human and divine.

The ARISTOTELIAN PHILOSOPHY is that which was taught by *Aristotle*, and maintained by his followers; it is also sometimes called *Peripatetic philosophy.* Aristotle was a disciple of Plato, but his system differed greatly from that of his master. Cicero tells us that Plato left two excellent disciples, Xenocrates and Aristotle, who founded two sects, the former called *Academics*, because they held their conference in the *Academy;* the latter, who followed Aristotle, were called *Peripatetics*, because they disputed *walking* in the Lyceum. The term *Academy* is derived from a grove near Athens, consecrated to the memory of *Academus*, an Athenian hero, where Plato taught his disciples.

The CYNICS were philosophers who exhibited a contempt for every thing, especially riches and state, arts and sciences, all except *morality.* The founder of this sect was Antisthenes, a disciple of Socra-

tes nearly 400 years before Christ. He was called an *ingenious and sincere dog*, it being the characteristic of the Cynics to attack and bark at the ill, and defend and fawn on the good; whence they were called Cynics. Diogenes was of this sect; he lived 330 years before Christ. There is an affinity between this sect and the

STOICS, but these were more modest and reserved than the Cynics. The Stoics were the followers of *Zeno*, and so called because he taught under a portico or piazza, called *στοα*, *stoa*. The *morality* of the Stoics was conveyed in paradoxes: as, the wise man is void of all passions and perturbation of mind; pain is no real evil; a wise man is happy amidst the severest torture; he is always the same and always joyful, &c. &c.: these and many other such absurdities were promulgated by the Stoics. They however admitted but one God, whom they called *Mind*, *Fate*, *Jupiter*, *&c.*; they, it is said, believed also that the soul survived the body. With all the errors of the Stoics, we must not forget that *Epictetus* was one of the sect; and that his *Enchiridion*, or manual of the Stoic philosophy, abounds in pure maxims of morality; the emperor Antonius said that he could collect from it wherewith to conduct life with honour to himself and advantage to his country. Mrs. *Carter* translated it into English; and Dr. *Knox* wrote an Essay on it. Epictetus, although born in Phrygia, was originally the slave of Epaphroditus, the freed man of Nero, lived mostly at Rome or the neighbourhood, and was esteemed by Adrian and Marcus Aurelius. He died at an advanced age, having flourished about the year 80 of the Christian era.

The CYRENIAC PHILOSOPHY, so called from Aristippus of *Cyrene*, a disciple of Socrates, was favourable to luxury and unfriendly to virtue or the welfare of society. It never obtained much attention.

The SOCRATIC PHILOSOPHY, is that maintained and taught by *Socrates* about 409 years before Christ. Socrates appears to have been one of the best and wisest persons in all the heathen world. He wrote nothing himself; the greatest part of his philosophy we have in the works of Plato. See *Scepticism* below.

The PLATONIC PHILOSOPHY is of course derived from *Plato*, who lived about 350 years before Christ; the philosophy of Plato approaches nearer to the religion of the Hebrews than that of any other pagan writer. Plato admits that the Greeks borrowed their knowledge of God from an ancient people, and by these it is supposed he meant the Jews. His account of man's state of innocence, &c.; in short, all parts of his philosophy show evident marks of a scriptural original.

The EPICUREAN PHILOSOPHY is derived from *Epicurus*, who flourished about 300 years before Christ. The Epicureans have in all ages been decried for their morals and attachment to the pleasures of sense; in the common use of the word an Epicurean signifies an indolent, effeminate and voluptuous person. There were, however, two kinds of Epicureans: the *rigid* placed all their happiness in the pure pleasures of the mind resulting from the practice of virtue; the *loose* or *remiss* placed all their happiness in sensual and corporeal pleasures. The former were the genuine Epicureans, the latter the sophists of their sect.

PYTHAGOREANS, those who adhered to the doctrines of *Pythagoras*, who flourished about 500 years before Christ. They taught

that there was but one God; that there is a transmigration of souls, and therefore that the soul is immortal; that *virtue* is harmony, health and every good thing. Some have endeavoured to prove that Pythagoras borrowed his philosophy from the religion of the Jews; but he never committed any thing to writing. The Pythagoreans studied the doctrine of numbers with great attention.

SCEPTICISM, the doctrines of the Sceptics, which consisted in doubting every thing, affirming nothing, and keeping the judgment in suspense on every thing. Socrates used to say, *I know nothing but this, that I know nothing;* which the Sceptics thus altered, *I know nothing, not even this, that I know nothing.* Scepticism is called also *Pyrrhonism*, from *Pyrrho*, its author, who lived about 500 years before Christ.

All the preceding philosophical sects originated in *Greece* long before the *Romans* were eminent as philosophers; both the Greeks and the Romans were, however, an enlightened people, as their numerous works on a variety of subjects sufficiently evince; even the philosophy of morals made considerable progress among them; and it is somewhat remarkable that Plato began to write as soon as the prophets ceased among the Jews, and thus many of the doctrines of the gospel were in effect taught at Athens long before the advent of the Messiah.

Of *Natural Philosophy*, *Moral Philosophy*, and *Mechanical Philosophy*, we have already spoken; a word or two on some *modern* philosophical doctrines, and we have done.

The CARTESIAN PHILOSOPHY, or CARTESIANISM, is the philosophy of *Des Cartes*, the founder of it, who was born at La Haye in Touraine in 1596. The *first* principle of this philosophy, "*I think, therefore I am*"; on this *Des Cartes*, *metaphysics* are built. The *second*, that on which his *physics* are built, is that, *nothing exists but substances.* Hence he concludes that there is *no vacuum* nor any possibility of it in nature. He next proceeds to explain, mechanically, how the world was formed; and how motion arose; whence many different *vortices*, *&c.* But we cannot enter further into it; as it is now considered rather as a romance than any thing else. It ought, however, to be stated that, by introducing geometry into physics, and accounting for natural phenomena by the laws of mechanics he did great service to philosophy, and thus assisted in paving the way for the philosophy of Newton. *Des Cartes* was an acute mathematician and deserves respect, for adopting the same principle of doubting as Socrates and Plato, but he made a better use of it.

MALEBRANCHISM, the doctrine of *Malebranche*, an eminent French metaphysician, who was born 1638. He was a priest of the oratory of France. His system is contained in his work, *Recherche de la Verite*, Search after Truth, of which Fontenelle says, that it is full of God, and to whom he refers as the only agent in all things. The manner in which Malebranche reconciles religion to his system is detailed in his work *Entretiens Chretiens.* While it is admitted that he has displayed great ability and genius, his doctrine is nevertheless considered ill-grounded, visionary, and even dangerous; upon the whole it is similar to Cartesianism; and, like that, has been opposed by many French authors, and also by Mr. Locke.

NEWTONIAN PHILOSHPHY, the doctrine of the universe as delivered by Sir *Isaac Newton*, who was born at Woolstrope in Lin-

colnshire, Dec. 25, 1642. The great principle upon which this philosophy is founded is the *power of gravity or attraction.* This principle is however not new: Kelper long before hinted at it in his *Introduc. ad Mot. Martis.* But the credit of bringing it to a physical demonstration was reserved for Sir Isaac Newton. The whole of this philosophy, as delivered by the author, is contained in his work called *Philosophiæ Naturalis Principia Mathematica* or Mathematical Principles of Natural Philosophy. It is called also the *New Philosophy* as contradistinguished from the *Cartecian*, the *Peripatetic*, and other ancient philosophy. The great merit of this philosophy has procured it almost universal reception in all countries; yet there have not been wanting some who have questioned, and still do question, the doctrine concerning what is called *gravitation.* Sir Isaac Newton died in 1727.

Other PHILOSOPHY may be mentioned; such is that called *Corpuscular*, which accounts for the accidents of bodies, as motion, rest, &c. by the minute *corpuscules* or atoms of which bodies are composed; *Theoretical or Speculative Philosophy*, which consists of mere contemplation; *Practical Philosophy* which lays down rules for a virtuous and happy life; more properly termed *Ethics*, or *Moral Philosophy;* the *Arabian*, *Atomical*, *Experimental*, *Hermetical*, *Mechanical*, *Oriental*, and *Scholastic Philosophy;* but as several of these are treated of under other heads in preceding parts of our work, and as others scarcely deserve a separate notice, we must content ourselves with merely mentioning their names.

As a sequel to this part of our work, we have deemed it useful to add a short account of the WONDERS OF THE CREATION.

Before, however, describing these, we will for a moment call the student's attention to the *greatest* of all WONDERS of which our senses are cognizant, namley, CREATION itself; the Sun, the Moon, the Planets, Comets, and all that immense myriad of fixed stars, which are *most probably*, suns, and have planets revolving round them similarly to those which revolve round the sun in our system; with, perhaps, innumerable stars never yet seen, dispersed over immense and unlimited space! When to these are added our *earth* and the *Being* which it contains, both animate and inanimate, surely the greatest of all wonders is creation itself. In contemplating these, man, finite man, is lost in their greatness, astounded at their incomprehensibility, and unable to account for them otherwise than by attributing them to the fiat or operation of some GREAT CAUSE, on whom his humble hopes, his future happiness must depend; We may add in the simple yet expressive language of COWPER;

> "*Nature* is but a name for an effect
> Whose cause is GOD."

But our limits will not permit us to examine individually the objects which we have here sketched; we must return to the earth and notice only

THE CHIEF WONDERS OF NATURE AND ART.

In this sketch, having already noticed, under the heads *Astronomy*, and *Geography*, some of the most striking points which cannot fail to

arrest the attention of the young student, we shall here confine ourselves to those natural objects on our globe, and to those artificial productions or efforts which deserve the attention of those who are stimulated by a laudable curiosity.

NATURAL WONDERS.

Among the natural wonders of the world, MOUNTAINS, unquestionably, hold the first rank, whether we consider them in regard to their height, or as being, many of them, VOLCANOES, emitting smoke, flames, and various bodies in an intense state of heat.

According to the most accurate accounts, the loftiest mountains in the world are those of the *Himalaya* chain, situated in northern India, between latitude 30°, and 32° north; this chain is visible from Patna, on the southern bank of the Ganges, as a continued well defined line of snowy cliffs extending through more than two points of the compass at a distance of about sixty leagues. Of twenty-seven peaks of this chain, it has been ascertained that nineteen are higher than *Chimborazo*, which will be presently noticed. The highest is said to be more than 25,000 feet above the level of the sea; and many others are more than four miles in height. But comparatively little is yet known of this chain of mountains: the limit of the perpetual congelation of water on them has, however, been ascertained to be at least *beyond* 13,500 feet above the level of Calcutta.

The stupendous mountains called the ANDES, by the Spaniards Cordilleras, pronounced by them *cor-dil-le-ras*, or chains of the Andes, extend near the western coast of South America, from the Isthmus of Darien throughout the whole continent to the Straits of Magellan. In the north are three chains, or separate ridges; from Popayan towards the south, those chains unite into one. In Quito, the more elevated summits are in two rows, which form a double crest to the cordillera. The cloudcapt summits of many of these peaks are covered with eternal snows, and below them is often seen to burst the storm, while

> "Far along .
> From peak to peak, the rattling crags among
> Leaps the live thunder,"

which is heard a great distance beneath the traveller's feet. These peaks stand, for the most part, on an elevated plain, which is itself considerably higher above the level of the sea than many European mountains. The line above which the snow never melts in the torrid zone is at about 14,600 feet, or nearly three miles above the level of the sea. CHIMBORAZO is the highest of these peaks; it stands on the plain of Quito, and is about 20,000 feet above the level of the sea. *Cotopaxi* is the loftiest of those peaks which have undergone eruptions; and notwithstanding it lies near the equator, it is covered with perpetual snow; its height is 18,876 feet. This volcano is the most mischievous of all those in Quito, and its explosions are the most frequent and disastrous; the masses of rock and scoriæ thrown out of it are immense. *Pichincha* is another of those peaks about 15,000 feet high; it was formerly a volcano; but at present neither smoke nor ashes issue from it. The extent of the Andes mountains is not less than 4300 miles.

Messrs. Humboldt and Bonpland approached within 1600 feet of the summit of Chimborazo, attaining the amazing height of nearly four miles; in their ascent they experienced a variety of inconveniences, among others that of great suffering from intense cold. Some of the most singular phenomena in this region of mountains are frightful precipices and deep abysses, called *Quebradas*, by which many of the mountains are separated from each other; some of these chasms are nearly a mile deep, and their sides almost perpendicular; they are nevertheless frequently adorned with trees, shrubs, and flowers. Natural as well as artificial bridges are occasionally seen over these deep and yawning lascerations; sometimes, too, a torrent rolls down their winding jaws, adding of course to the sublimity of the scene. The condor, too, that huge bird, is occasionally here seen flapping his immensity of wing.

Of European mountains, the "Alpine Summits," *Mont Blanc* and *Mont Rosa* are the highest. Mont Blanc is said to be 15,872 feet above the level of the sea, Mont Rosa about the same height, but the latest accounts say that it is even higher than Mont Blanc; both are covered with perpetual snow. These mountains are surrounded by those collections of snow and ice called GLACIERS. M. de Saussure ascended to the summit of Mont Blanc, in 1787, where, for four hours and a half, he and his companions enjoyed, with rapture and astonishment, a view at once the most rugged and sublime in nature. Several attempts have been since made to ascend it, some successful; but many have perished in the enterprise.

The GLACIERS surrounding many of the Alpine peaks are not the least of the wonders of those regions. Lord Byron has well described the whole scene.

"Above me are the Alps;
The palaces of Nature, whose vast walls
Have pinnacled in clouds their snowy scalps
And throned Eternity in icy halls
Of cold sublimity, where forms and falls
The avalanche—the thunderbolt of snow!
CHILDE HAROLD, Canto iii.

The three great *Glaciers*, or ice mountains, which descend from the flanks of Mont Blanc present a magnificent spectacle amid the succession of icy summits, of deep valleys, and of wide chasms, the channels of torrents, and the scenes of cataracts with which these mountains abound. Nor is the *avalanche* the least tremendous or wonderful amidst these icy regions: it consists of an immense mass of snow and ice detached from the mountain above, and rolling or sliding into the valley below, overwhelming villages and man and beast in ruin. The details of its disastrous effects have often excited the sympathy and the wonder of mankind.

It is remarkable that most of the matter, of which the loftiest *European* mountains are composed is *granite*, one of the hardest, primitive, and most indestructible of rocks; the highest points of the *Andes* consist of *porphyry*.

From the loftiest we will now pass to the VOLCANIC mountains, such are *Etna*, *Vesuvius*, *Teneriffe*, &c. Cotopaxi in South America, we have already mentioned.

MOUNT ETNA is in the island of Sicily; it is called *Gibello* by the inhabitants. It is said to be sixty-three miles in circumference, and is above 10,000 feet high. It is ten miles north of the town of Catania. The lower region of the mountain contains towns, vineyards, corn fields, and pastures; the middle region is crowded with forests of oaks and chestnuts of immense size, interspersed with many other trees; the upper part is entirely destitute of vegetation, and always covered with ice and snow, except here and there a layer of black ashes. It is seen distinctly, on a clear day, from Valetta, the capital of Malta, a distance of 150 miles. It is the largest burning mountain in Eùrope. A journey up Etna is considered an enterprise of importance, as well from the difficulty of the route as from the distance, it being, it is said, thirty miles from Catania to its summit. The crater of Etna is of an oval shape, about a mile and a half round, having its edges in many places indented by projecting lavas or scoriæ; the bottom of the crater, when visited some years since by Spallanzani, was nearly a horizontal plane, about two thirds of a mile in circumference, whence issued a constant column of smoke, and hence, as well as from the sides, arose several streams of smoke resembling thin clouds. Within the aperture a liquid ignited matter was clearly seen constantly undulating, boiling, rising and falling, without spreading over the bottom. On the vastness and beauty of the scene from the summit of Etna all authors agree; there is not, perhaps, any elevated region on the globe which offers a more magnificent prospect of sea and land. *Etna* has been celebrated as a volcano from the highest antiquity; its eruptions are recorded by Diodorus Siculus, as having happened 1693 years before the Christian era. In 1669, a torrent of lava inundated a space of fourteen miles in length and four in breadth, burying beneath it a part of Catania. In its course it destroyed 5000 habitations. When it reached Catania, it rose over the walls, and then ran into the sea. In 1809 twelve new craters opened, about half way down the mountain, and threw out rivers of burning lava. In 1811 another eruption took place, and torrents of burning matter were ejected. A roaring, like that of the sea in a tempest, was heard within the mountain, accompanied with dreadful explosions, resembling thunder, which re-echoed through the valleys, and spread terror on every side. The eruptions of this, and indeed most other volcanoes, are usually preceded by thunder, lightning, frequent concussions of the earth; in a word, earthquakes and dreadful subterraneous noises. In the eruption of 1669, ignited rocks, fifteen feet long, were hurled to the distance of a mile, others of a smaller size were carried three miles.

MOUNT VESUVIUS is situated about seven miles, in an eastern direction, from Naples. It lies on a well cultivated plain, presenting two summits on the same base. Its height from the level of the sea is scarcely 4000 feet. It may be ascended by three ways, all very steep and difficult, from the conical shape of the mountain, and the loose ashes which slip from under the feet. It is cultivated for more than two-thirds of its height, its top alone being brown and barren; the distance from its base to which being not more than three Italian miles. Upon the lavas which this volcano has from time to time ejected, and which, like great furnaces, extend into the plain and the sea, are built houses, villages, towns; round which are gardens, vineyards, and cultivated fields. Yet apprehensions about the

future arise, on the recollection that beneath a soil so fruitful and so smiling lie edifices, gardens, and whole towns swallowed up. *Portici* rests upon *Herculaneum;* its environs upon *Resina;* and at a short distance is *Pompeii,* in the streets of which, after having been buried by the eruptions of Vesuvius for more than seventeen hundred years, the astonished traveller now walks. The clearing of the streets of this ancient and long annihilated town, has brought us acquainted with many curious facts regarding the arts and modes of life of the ancient Romans. The eruption which overwhelmed Herculaneum, Stabia, and Pompeii, was fatal also to the Elder Pliny, who, lying at Misenum with a fleet which he commanded, and being surprised at an extraordinary cloud arising from Vesuvius put to sea, and landed at the foot of the mountain, to ascertain the cause of the phenomenon: but the sulphureous vapour from the burning lava suffocated him, in the 79th year of the Christian era. Pliny the Elder was distinguished as a writer on natural history; his works still remain to us, and are curious specimens of the knowledge of his age. Thirty-eight eruptions of Vesuvius have been recorded in history, up to the year 1806. That of 1779, described by Sir W. Hamilton, is among the most remarkable.

The PEAK of TENERIFFE is a volcanic mountain, situated on the island of the same name, one of the Canaries. The island continues to rise on all sides from the sea, till it terminates in the *peak,* situated, however, rather in the southern part than in the centre of the island. The peak is in height 12,166 feet; after ascending to a small sandy platform of pumice stone, 9,780 feet above the level of the sea, and bordered by two enormous currents of vitreous lava and blocks of the same, you find the acclivity become very steep, with great masses of scoriæ, extremely rough and sharp, covering the currents of the lava. Towards the summit nothing but pumice-stone is to be seen. The sides of the crater are precipitous within; its form is elliptical; its circumference about 1100 feet, and its depth, according to Humboldt, from forty to sixty feet. The sides consist of an earth of snowy whiteness, resulting from the decomposition of black porphyritic lava. The solid parts are covered with shining crystal of native volcanic sulphur. Sulphureous vapours issue in abundance from an infinity of fissures. Humboldt regards this mountain as basaltic, resting on a dense secondary calcareous stone. Besides the incrustations of sulphur, it should be observed, that opal in thin plates is formed here with great celerity. Notwithstanding the heat which, Humboldt informs us, he felt in his feet at the edge of the crater, the cone of ashes remains covered with snow during several months in winter. The Hon. Mr. BENNETT ascended this mountain in 1810; an account of the journey will be found in the transactions of the Geological Society, but we cannot detail it. The first eruption of this mountain, of which a distinct account is given, occurred in 1704; a subsequent eruption in 1706 filled up the port of Guarachio; the lava, in its descent, ran five leagues in six hours: on this lava houses are now built, where formerly ships rode at anchor. The last eruption was in 1798, and very terrible. None of these eruptions were from the crater on the summit, that not having ejected lava for centuries: it now issues only from the sides. Several mountains on this island, beside that usually called the peak, are said to have been formerly volcanoes.

The SOUFFRIERE MOUNTAIN is the most elevated and most northerly chain, running through the West India island of St. Vincent. From the frequency and violence of the earthquakes to which this island was exposed in 1811, some extraordinary movement was expected. Before the eruption, which took place in April 1812, at about 2000 feet above the sea, on the south side of this mountain, and at rather more than two thirds of its height, was a circular chasm, about half a mile in diameter, and between 400 and 500 feet deep. In the centre of this capacious bowl rose a conical hill, about 300 feet high, and 200 feet in diameter; it was richly covered and variegated with shrubs, brushwood, and vines, above half way up; the remainder was covered over with virgin sulphur to the top. From the fissures of the cones a thin white smoke was constantly emitted, tinged occasionally with a bluish flame. The precipitous sides of this magnificent amphitheatre were also adorned with evergreens, aromatic shrubs, flowers and alpine plants. This lonely and beautiful spot was rendered more enchanting by the singularly melodious notes of a bird wholly unknown to the other parts of the island—hence called or supposed to be invisible; it has however been seen, and is a kind of blackbird: most probably the *mocking bird, Turdus polyglottus.*

A century had elapsed since the last convulsion of the mountain; and the luxuriant vegetation and growth of the forest which covered it seemed to discountenance the fact that it was formerly a volcano. Such was the majestic and peaceful *Souffriere* till the 27th of April 1812, when the resurrection of this fiery furnace was proclaimed, with all the horrors attendant on concussions of the earth, noises in the air, and a vast column of thick, black, ropy smoke bursting forth at once, and mounting to the sky, scattering sand and ashes on all below. For several days these horrors increased; the inhabitants settled at the foot of the mountain, abandoned their houses, with their live stock and every thing they possessed, and precipitately fled. Dismay seemed the triumphant arbiter of the scene. On the 30th of April the immense cauldron of lava boiled over, and surmounting every obstacle, carried rocks and woods together in its course down the mountains, and in about four hours reached the sea. Early the following morning another stream of lava was seen descending to the eastward. The thundering noise of the mountain, mingled with the sudden, yet monotonous roar of the rolling lava, became so terrible, that dismay was almost turned into despair. At this time occurred an earthquake, followed by showers of cinders, which fell during two hours with the hissing noise of hail. Subsequently a rolling on the roofs of houses, indicated a fall of stones, which soon thickened, and at length descended in a rain of intermingled fire, threatening them with the fate of Pompeii or Herculaneum. The crackling coruscations from the crater at this period, exceeded all that had yet passed; the eyes were struck with momentary blindness, and the ears stunned with a confusion of sounds. People sought shelter in cellars, under rocks, or any where; and the miserable negroes flying from their huts, were knocked down, and many of them killed in the open air. Earthquake followed earthquake almost continually; and the whole of that part of the island on which the mountain was situated was undulated like water shaken in a bowl. The whole island was covered with cinders, scoriæ, and broken masses of volcanic matter. Many other

curious particulars of this eruption have been related; but our limits compel us to desist.

We have thus briefly described four of the most considerable volcanoes which are known; there are still many others, an account of which would much interest and entertain our readers; but we must merely content ourselves with naming the chief.

In Iceland, which is most probably wholly a volcanic product, is

" *Hecla* flaming through a waste of snow ;"

yet, although many eruptions of this mountain are recorded, none of lava has occurred since 1766. *Stromboli* one of the Lipari islands, lying on the north of Sicily, is also a volcano, the present crater of which has burned for more than a century. It appears to be constantly active; so much so, as to be called the *light-house* of the Mediterranean. Most of the Lipari islands either now are, or once were, volcanoes; among these, besides Stromboli, *Vulcano* may be mentioned. There are three volcanoes in Kamtschatka, which, for years, have thrown out considerable smoke, but do not often burst into flame. There is also a volcano on the island of Luconia, in the East Indies; in 1814 a dreadful eruption of it took place, destroying five populous towns, in which more than 1200 inhabitants perished, and 20,000 were stripped of their possessions, and reduced to beggary. To these may be added several volcanic islands which have risen from the sea.

To our account of volcanoes may be added that of very *hot spouting springs*, the chief of which are the GEYSERS in Iceland; the largest and most remarkable of which is situated in a large field about sixteen miles from Skalholt. At a distance of a mile and a half a loud roaring noise is heard, like that of a torrent precipitated from stupendous rocks, each ejection being accompanied by violent detonations. Travellers give various accounts of the highest jets of this spring; Van Troil mentions 60 feet; Dr. Henderson 150 feet; others say they vary from 90 to 360 feet: the heat is about 212 degrees (the boiling point). The opening is perfectly circular, in diameter nineteen feet, around which, on the surface of the ground, is a bason fifty-nine feet in diameter, the edge of which is nine feet above the orifice. The inhabitants boil their meat in this spring.

The SULPHUR MOUNTAIN, also in Iceland, near the village of Kriesevik, contains a *cauldron of boiling mud*. The whole of this mountain is more or less impregnated or covered with sulphur, mixed with clay. In one part of it, at the bottom of a hollow is the cauldron of mud, which Sir G. Mackenzie found,boiling with great vehemence, the mud was in constant agitation, and often thrown up to the height of six or eight feet; near the spot was a space filled with water boiling briskly. Vapours issue from various places in this mountain, sometimes with very considerable noise. The clay on various parts is hot and soft; so hot indeed as nearly to approach the boiling point. This mountain can scarcely be traversed without danger. There are also some curious *mud springs* in the centre of an elevated plain on the island of Java; from which immense bodies of soft mud are thrown up to the height of ten or fifteen feet, in the form of large bubbles, which bursting, send out volumes of dense white smoke. The gas they emit stinks like a gun-barrel. The water in the mud-

springs of Java is cold; from it is obtained a considerable quantity of common salt.

Of CATARACTS some notice must be taken. One of the most stupendous is that usually called the FALLS of NIAGARA. The river Niagara, in Upper Canada, takes its rise in Lake Erie, and after flowing twelve leagues, empties itself into Lake Ontario. About eighteen miles from the first lake are the FALLS OF THE NIAGARA, three miles above which the stream becomes so exceedingly rapid, that no boat can venture on it. As it approaches the falls, it rushes along with redoubled fury, until reaching the edge of the precipice, it shoots suddenly down, without meeting with any obstruction; not indeed in one entire sheet, but being separated by islands, forms three distinct falls. The chief of these is called the *Horse shoe Fall*, from its shape; the circumference of it is estimated at upwards of 1000 feet. The line of cataracts winds obliquely across the river, and hence has a greater extent than if the river was crossed directly from one bank to the other. The river below the falls is not sufficiently calm for navigation till it reaches Queen's Town, nine miles below the cataract. To describe the noise and impetuosity of such an immense body of precipitated water is quite impossible; all travellers agree that the scene itself is beyond description. The height of the precipice over which the water falls is about 140 feet. The width of the river at the falls has not been accurately ascertained; but it is supposed to be more than a quarter of a mile; the noise of these falls may be sometimes heard at a distance of forty miles. The foaming spray, glittering in the sun-beams, displaying a thousand elegant variations, is not the least among the curiosities of this singular spot.

Of the various other cataracts with which creation abounds, we must be brief. Those of the Andes are said to be unrivalled: that of *Tequendama* dashes, at two bounds, down a perpendicular height of 600 feet, with an astounding roar, into a dark and frightful abyss.

The tremendous cataracts of *Maypure* and *Apure*, in New Granada, may also be mentioned. The falls of *Montmorenci*, near Quebec, are also deserving notice; so also is the *Tuccoa fall*, in Franklin County, Georgia; this fall is much higher than that of Niagara. The *Falls* of the *Missouri* have been described by Captain Clarke. There is also a water-fall in the colony of the Cape of Good Hope, of which travellers speak highly. The *Cataracts of the Nile*, one of which was visited by Mr. Bruce, are ten or twelve in number before that river reaches the level of Egypt. The *Cataract of the Mender*, the Scamander of the ancients, is beautifully described by Dr. Clarke. Of the numerous cataracts abounding in the Alps, those in the vicinity of Mount Rosa are particularly deserving of attention. The fall of the *Staub Bach*, in the valley of Lauterbrannen, is estimated at 900 feet of perpendicular height. At Lauffen, near Schaffhausen, in Switzerland, is a tremendous cataract of the Rhine; it is in height sixty feet. The British dominions abound also in cataracts; one in Devonshire, where the Tamer receives the Lid, falls one hundred feet; in Cumberland and Wales are also many interesting ones. In Scotland, the *Fall of Fyers* is a vast cataract. In Ireland, the Shannon has a prodigious cataract, which prevents that river from being farther navigable.

Of EARTHQUAKES, those alarming and sometimes destructive concussions of the earth, in an account of the natural wonders

of the world, some notice must also be taken. They very often precede or accompany the eruptions of volcanoes; but they are sometimes felt without such assignable causes; although there is reason to believe that they are produced by some deeply seated, and more distant or remote infernal fire, produced by the disengagement of the gases. Some, however, attribute earthquakes to powerful electric shocks. They have been felt in various parts of the world; even England has not escaped from them. The earthquakes of ancient times were numerous and destructive: among the most destructive was one in Asia Minor, by which thirteen cities were swallowed up in one night; another occurred in Italy in the province of Mutina, by which several towns were destroyed. Antioch, during the reign of Trajan, was, together with a great part of the adjacent country, destroyed by an earthquake; in the reign of Justinian, 300 years afterwards, it was again destroyed, with 40,000 of its inhabitants; after an interval of sixty years it was again destroyed, with the loss of 60,000 souls. An earthquake happened at Rhodes 200 years before the Christian era, which threw down the *Colossus*, a brazen statue considered as one of the wonders of the world, and did other damage. In 1182, several of the cities of Syria and of the kingdom of Jerusalem were destroyed by a similar catastrophe.

An earthquake in Calabria, in 1638, was astounding and disastrous, in which the city of Euphæmia was wholly swallowed up. This earthquake was evidently connected with the volcano of Stromboli. But one of the most remarkable earthquakes on the records of modern times, is that which occurred at Lisbon in the year 1755; it extended over a large portion of the surface of the earth, and appears to have originated beneath the Atlantic Ocean, the waves of which were almost as violently shaken as the land; it pervaded Europe, Africa, and America, but its greatest violence was felt on the south-west parts of the first named continent.

Lisbon has many times experienced the calamities of an earthquake; in 1531, and besides that to which we have just alluded, it has since, in the year 1761, 1765, and in 1772, been visited with similar although not equally destructive catastrophes. It was on the morning of the 1st of November, in the year 1755, that this tremendous earthquake occurred; and so powerful was the concussion that it overthrew every church and convent in the city, together with the Royal Palace, the Opera House, &c., in short, no building of any consequence escaped; about one fourth of the dwelling houses were thrown down, and at a moderate computation, 30,000 individuals lost their lives. The number of persons who perished in the churches was considerably greater than those who were destroyed in the streets and the houses; as it was a day of solemn festival, crowds were assembled at mass. The shocks, though tremendous, were short, and the whole, on this day, lasted no more than from five to seven minutes. What added to the consternation was the bursting out of fires in different parts of the city; and, from a calm, a gale sprang up, which, aiding the flames, in the space of three days the city was nearly reduced to ashes. Soon after the earthquake, the sea rose in an instant nearly forty feet, and had it not subsided as suddenly the whole city would have been submerged. The dismay and horror of the survivors of this calamity may be better imagined than described. Although the chief shocks occurred on the 1st of November, yet be-

tween that day and the eighth of the same month twenty-two shocks were reckoned, some of which did much mischief. This earthquake was also severely felt at *Oporto*. *St. Ubes* was entirely swallowed up by it; at *Cadiz* it also did considerable damage; it was also felt at *Gibraltar* and *Madrid*. The greater part of *Algiers* was destroyed by it, and many other places in Africa felt its power. It was also felt in the island of *Madeira;* in many places in *Germany* and *Holland;* and also in England, particularly in *Derbyshire*, *Surrey*, *Kent*, *Berkshire*, *Oxfordshire*, in *Glamorganshire*, in *Scotland*, and in *France*. The shocks of this earthquake were felt also by several ships traversing the Atlantic Ocean.

To the earthquakes which have occurred in *Sicily* and the *Calabrias* we can only allude; they have been numerous, and sometimes very disastrous; they are evidently connected with the volcanic action constantly going on in those regions. By one of these the fine city of Messina, in Sicily, in the year 1783, was in great part destroyed. The earthquakes in Peru and other parts of America are often very disastrous. Lima is particularly subject to them. An earthquake occurred in *Jamaica*, in 1692, which, in two minutes, destroyed the town of Port Royal, and sank the houses in a gulph forty fathoms deep. *Venezuela* has also been visited with these convulsions; in less than two minutes, on the 12th of May, 1812, nearly twenty thousand persons were destroyed. The island of Java has also experienced earthquakes; the greatest part of Papandayang, formerly one of the largest volcanoes on the island, was, in August 1772, after a short but severe combustion, swallowed up by a dreadful convulsion of the earth.

The limits which we have assigned to our description of natural wonders being already exceeded, our account of those not hitherto noticed must be necessarily short. Of the *tides*, *singular currents*, *icebergs*, *lakes*, and many other natural phenomena, we are absolutely prohibited from speaking for want of space; of *rivers* we have only given a slight sketch under our geographical notice; nor can we notice the *hurricanes*, so destructive in warm climates; the wide and inhospitable *deserts* of moving sand, which pervade many parts of Asia, Arabia, and Africa; the *pitch-lake* of Trinidad; the *Upas*, or poison tree of Java; the *yanar or perpetual fire*, found in Asia Minor; *coral reefs* and *Islands; sand spouts* and *water spouts;* the immense *hills* formed by the *termites* or *white ants;* nor of animated nature can we notice the *alligator;* the *boa constrictor*, that immense serpent which swallows large animals whole: nor, indeed, a numerous variety of animals, a contemplation of which excites at once our admiration and astonishment; but must refer to books professedly describing such subjects. There are, however, a few

SUBTERRANEOUS CAVERNS, to which we must direct the reader's attention. The first is called

The Great Kentucky Cavern,

situated in Warren County, in the State of Kentucky, North America. This stupendous cavern is unparalleled in the history of subterranean wonders. It has been only recently known to the public as a curiosity, the accounts of it having appeared in 1816. It is situated in a broken but not mountainous country; in this differing from all

other caverns hitherto known. It is difficult to give a compressed description of it; but it is entered through a pit forty feet deep and 120 feet in circumference, having a fine spring of water at the bottom, which leads to the entrance of the cavern, the opening of which is forty feet high and about thirty wide; it narrows shortly after, but again expands to a width of thirty or forty feet, and a height of twenty. Continuing these dimensions for about a mile, we arrive at what are called the first *hoppers*, where a manufactory of saltpetre has been recently established. Thence to the second hoppers, two miles from the entrance, it is forty feet in width and sixty high. In advancing into the cavern, the avenue leads from the second hoppers west one mile, and thence south-west to the chief erea or city, which is six miles from the entrance. This avenue throughout its whole extent is from sixty to one hundred feet in height, of a similar width nearly level, the floor being covered with loose limestone and saltpetre earth; the immense erea called the chief city contains upwards of eight acres without a single pillar to support the solid and entire arch over the whole, and at least one hundred feet high, than which nothing can be more magnificent or sublime. Of the various avenues diverging from this erea our limits forbid us to speak. Dr. Nahum Ward, from whose description of the cavern our sketch is taken, relates many other curious particulars; one is, that one of the avenues leads to an arch which covers at least six acres, and that the extremity of this avenue cannot be less than *ten* miles from the mouth of the cavern. From Dr. Ward's account, the chief parts of the sides, roof, and floor of this cavern consist of lime-stone mixed with saltpetre earth; the air is good and the water clear; a mummy has been found here; in some part is a cataract; altogether it is one of the greatest of subterranean curiosities. Notwithstanding no account of this cavern was made generally public before the year 1816, workmen were employed in it as early as 1802; at which time severe shocks of earthquakes were felt in Kentucky, and also by the workmen in the cavern, to which those shocks did little or no damage. On the columns of spar and other petrifactions, and a fine stream of water, we cannot enlarge; the mummy, with the apparel, jewels, music, &c. is in the museum at Washington. To what tribe of people it belonged, and by whom formerly this stupendous cavern was occasionally and for what purposes occupied, we are wholly ignorant.

The GROTTO of ANTIPAROS, one of the Cyclades in the Grecian Archipelago, deserves also notice. After passing through a long narrow alley surrounded on every side by stones which glitter by torchlight like diamonds, the traveller is led to an awful precipice, and thence lowered into a deep abyss, whence he proceeds to another precipice, which he also descends, and after passing through a vestibule with walls and arched and polished roof composed of glittering red and white granite, supported at intervals by columns of deep blood-red shining porphyry, he descends another slanting passage filled with petrifactions, and having towards its extremity two pillars of yellow marble, which seem to support the roof; the last precipice is descended by a ladder. The traveller having descended to the depth of about 1500 feet beneath the surface, now enters the grotto. It is in width 360 feet, in length 340; and in most places 180 in height. Here he finds himself beneath an immense and finely vaulted arch, with icicles of shining white marble. Among these are suspended festoons of leaves

and flowers of the same substance. The floor is paved with crystal of different colours, the whole of which, by the light of torches, yields a splendour and beauty not to be described. The roof, the floor, the sides of the whole series of these magnificent caverns, and the columns, some of which are twenty-five feet long, pendent above, and out of the reach of mischievous destroyers, yield a delight absolutely beyond the graphic delineation of pen or pencil.

Of the many other curious caverns in Germany and Hungary, some containing *fossil bones;* of the *Grotto del Cane*, mentioned before in page 102; the *grottoes of the Cevennes mountains*, in Lower Languedoc; the *caverns in the rock of Gibraltar;* &c. &c. we must omit a description, and conclude our account of natural wonders, by a notice of the most striking in the British islands. Of these, perhaps

FINGAL'S CAVE, or, the GRAND STAFFA CAVERN, on the island of Staffa, in Scotland, composed of basaltic pillars, standing in natural colonnades mostly above fifty feet high, is the most singular; it is situated close to the sea, the waters of which flow into it; its length is 371 feet, breadth at the mouth 53 feet; height at the mouth, 117 feet; the depth of water at the mouth 18 feet, at its extremity 9 feet. The whole island of Staffa appears to be composed of the same materials; of the cave itself it may be said, that it is at once stupendous and magnificent. The transition from this basaltic wonder to that of the

GIANT'S CAUSEWAY is direct; it is situated in the vicinity of Ballimony, in the county of Antrim, in Ireland, and consists of an irregular arrangement of many hundred thousand columns, formed of a black basaltic rock, nearly as hard as marble; they are generally of a pentagonal form and closely impacted, though perfectly distinct, from top to bottom; they are of unequal height and breadth; several of the most elevated and visible above the strand, and at the foot of impending angular precipices, are twenty-three feet high; how deeply they descend into the strand has not been ascertained. This columnar arrangement is in length two hundred yards to the low water; how far it extends into the sea is not known. The breadth of the principal causeway is in general from twenty to thirty feet; in some parts nearly forty. The cliffs of this part of the coast of Ireland, at a great distance from the causeway, exhibit similar columns. It may be mentioned, that in the country surrounding Padua, in the state of Venice, are several columns similar to those of the Giant's Causeway.

The PEAK OF DERBYSHIRE contains many wonders, among which POOLE'S HOLE, ELDEN HOLE, the PEAK CAVERN or DEVIL'S HOLE, MAM TOR, St. ANN'S WELL, the EBBING and FLOWING WELL, and the CRYSTALLIZED CAVERN, are the most noted. Of these the PEAK CAVERN excites the most lively interest. It is situated near Castleton. The entire length of this cavern is 2250 feet; and its depth from the surface of the Peak Mountain is 620. In one part the visitor is ferried over a lake in a boat; a stream of water flows through this subterranean vault, which is, beyond question, one of the most sublime and extraordinary productions of nature.

We may just add, that the CAVE OF WOOKEY, near Wells, in Somersetshire, commonly called WOOKEY HOLE, is deserving a visit from the curious in natural wonders: the length of this cave is 350 yards; a river of water flows through it, and forms at its exit, near the entrance, a fine and astounding cascade. There is also a *cavern* in the

CLIFFS OF CHEDDAR, about eight miles from Wookey Hole;

but the cliffs themselves, the chief of which are perpendicular, and 300 feet high, are well deserving the attention of those who delight in Nature's wonders. While in this region of England, we may mention the VALLEY OF ROCKS as a natural curiosity in the north of Devon, and St. VINCENT'S ROCKS near Bristol, both monuments of the stupendous power of Nature beyond that of art.

Of the numerous and tremendous *precipices* on the globe we can take no notice, except that one in South Carolina, called the *Precipice of the Table Mountain*, would seem exclusively to claim our attention from its great height, *nine hundred feet*, and the awful sublimity which surrounds it.

A notice of one more natural wonder, and we have done.

AEROLITHS, or METEORIC STONES, are those bodies which are known, from time to time, to have fallen through the air to the earth. Nothing certain of their source or origin is known. The ancients have recorded the descent of such stones. Pliny relates, that a shower of iron (thus he calls these stones) fell in Lucania. Modern instances are, however, better authenticated; besides many previously to the year 1672, in that year two stones fell near Verona, in Italy, one of which weighed 300, the other 200 pounds; they fell with a violent explosion, in a sloping direction, and calm weather; and appeared to burn and plough up the ground. This phenomenon was witnessed by 300 or 400 persons. Since this the descents of aeroliths have been regularly authenticated, and are very numerous. The last occurred in Normandy, in 1812. It consisted, in its passing through the air, of a fiery globe of great splendour, and was followed in a few seconds by a violent explosion, which was heard at a great distance; the number of stones which fell exceeded 3000, the largest weighed nearly twenty pounds. It is remarkable, that all the iron found native, is similar in composition to all meteoric stones, they consisting of iron and a portion of nickel. A mass of native iron was discovered by Professor Pallas which weighed 1600 pounds; and one in Peru which weighed the enormous weight of fifteen tons: from their similarity, nay identity, with meteoric stones, there is every reason to conclude that such masses have fallen from the air. Mr. BRANDE inclines to the hypothesis, that those bodies might come from some volcano in the moon.

ARTIFICIAL WONDERS.

Of these our account must be short. Several wonders of art have been already mentioned; such are the *salt mines* of Poland, page 33; the *electrical* and *Galvanic* apparatus; the *steam engine*, the *steam boat*, &c. We shall first proceed to notice a few of the most singular ancient evidences of the ingenuity of man.

The PYRAMIDS of EGYPT, of which three near Djiza are the chief, are alluded to in page 397; that of *Cheops*, the largest, is said to be 448 feet high; that of *Cephrenes* is 398 feet high; and that of *Mycerinus* 162 feet in height. They are of course quadrangular, and composed of large stones, gradually receding like steps from the base, till they terminate nearly in a point at the top. The chambers in some of these pyramids are extremely curious, and well worthy of inspection. By whom they were erected, or for what purpose, is

not known. They were nearly in the same state in which they now are many centuries previous to the Christian era. BELZONI, after immense labour, penetrated one of the large pyramids.

The PYRAMIDS of SACCARA, also in Egypt, are numerous and interesting, on account of the peculiarities of their structure. It has been conjectured that these, as well as the pyramids of Djiza, were sepulchral monuments; but of this nothing is certainly known.

At a short distance from the great Egyptian pyramid is the SPHINX, cut out of the solid rock, the enormous bulk of which attracts attention. It is in height twenty-seven feet; the beginning of the breast thirty-three feet wide; it is said to have been the sepulchre of Amasis. The proportions are colossal, the outline graceful, the expression mild; the character African, but the mouth has an admirable delicacy of execution; it seems real life and flesh; art must have been considerably advanced when this monument was erected.

The RUINS of the TEMPLE of HERMOPOLIS are of the finest marble, and have neither cement nor mode of union besides the fitting of their respective parts. They have remained untouched, neither altered nor deformed by the works of modern times, it is said four thousand years.

The RUINS of the TEMPLE of APOLLINOPOLIS MAGNA surpass, it is said, every thing to be seen in Egypt, or elsewhere, in extent, majesty, and magnificence.

The RUINS of THEBES, called by Homer the *City with the Hundred Gates*, are also deserving notice, among which is a remarkable temple; nor should we omit to mention the *Tombs of the Kings of Thebes*, which consist of grottoes supported by pillars, and decorated with paintings and sculptures.

The EGYPTIAN CATACOMBS demand also a passing notice. A *catacomb* is a subterranean place for the burial of the dead. Catacombs are found in various places besides Egypt; in Italy about Rome, and also at Naples. The most singular of modern catacombs are those formed by the quarrying of stones under the city of Paris.

Catacombs may be seen in various places of Egypt; the bodies found in which are called *mummies;* several of these are in the British Museum. But some of the most celebrated catacombs are those of *Alexandria*, a short distance from the shores of the Mediterranean: their intricacy is such, that the guides will not enter them without a clue or thread to secure their return to the day. They are hollowed out of a soft sandy rock. The sculptures in many parts of these primeval sepulchres, are very elaborate; besides which, great labour has been bestowed in their construction.

Of the ancient *City of Alexandria*, formerly the capital of Egypt, we may just observe, that it was famous for a large library, collected by the Ptolemies, at a vast expense, from all parts of the world; and that this library was burnt by order of the Caliph Omar, in the seventh century; it is said that for six months the numerous volumes supplied fuel for the 4000 baths used for the health and convenience of the inhabitants of that populous city.

The Egyptians certainly excelled in the art of embalming, as the mummies found in Egypt are in a better state than embalmed bodies found in any other part of the world. Laying up bodies in caves appears to have been a very early method of disposing of the dead; and, it is said, was propagated by the Phœnicians throughout the

countries to which they sent colonies. Interring in temples is said to have been first practised by the Christians; this practice is now, however, and very properly, on the decline: the late acts of parliament for building churches forbid interment in the new structures.

The researches of BELZONI have thrown much light on the singular antiquities of Egypt; the TEMPLE of TANTYRA or TENTYRA, is esteemed by him the cabinet of the Egytian arts, the source of study for centuries: here DENON thought himself in the sanctuary of the arts and sciences. On all the walls, columns, cealing, or architraves, is scarcely a space which is not covered with some figures of human beings, animals, plants, emblems of agriculture, or of religious ceremonies. Wherever the eye turns, every thing inspires respect and veneration. The temples of EL KALASBE and of YSAMBUL are also well deserving notice.

The splendid RUINS of PALMYRA, in Syria, or TADMOR, as it is sometimes ealled, (thought by some to have been the Tadmor in the wilderness, built by Solomon,) contain the remains of temples, palaces, and porticoes of Grecian architecture, and of exquisite workmanship, over an extent of several miles.

Of BALBEC, about fifty miles from Damascus, the ruins are at once magnificent and imposing; thence proceed we to

The RUINS of BABYLON, one of the most ancient of cities, and generally regarded as the most interesting of all monuments of antiquity, chiefly from the numerous associations connected with it, and the frequent mention of "BABYLON" in the Sacred Writings. Here, however, it appears, that BRICKS form the chief material of which these ruins consist. Babylon was situated in a plain of great extent, and bisected by the Euphrates, a fine river. Herodotus describes it with some minuteness, according to whom the walls were sixty miles in circumference. The Temple of Belus, with its towers, was of immense extent; one of the towers far exceeded the Great Pyramid of Egypt in height. The far-famed hanging gardens, and numerous other curiosities of this mighty city, have ages ago disappeared; and nothing remains but dilapidated walls, and masses of ruins, to declare what once such a city must have been; what the activity and intelligence of the people who produced it. Some of the *Babylonian bricks* are deposited in the British Museum. See page 397.

Among other PERSIAN ANTIQUITIES the RUINS OF PERSEPOLIS demand attention; we may also notice the ROYAL PALACE OF ISPAHAN, a modern structure, of which travellers speak highly. Nor should the TEMPLE OF MECCA, known to Mussulmen by the name of EL HARAM, or Temple of Excellence, be wholly omitted in a catalogue of Eastern artificial wonders.

Of HINDOO and other ASIATIC evidences of the arts, many examples might be given. The TEMPLES OF ELEPHANTA on the island of *Elephanta*, distant about two leagues from Bombay, (so called from the figure of an Elephant shaped out of the rock as large as life near the landing place,) consist of many excavations *cut out of the solid rock;* the chief temple has four rows of massive columns uniform in their order, and at regular distances, forming three magnificent avenues from the principal entrance to the grand idol, which terminates the middle vista. The central image is composed of three colossal heads, reaching nearly from the floor to the roof. It represents the triad deity in the Hindoo Mythology,—Brāhma, Vishnŭ, and Sivā, in

the character of Creator, Preserver, and Destroyer. The view from these caves is very fine, as they are 350 feet above the level of the sea. But these Hindoo sculptures are nevertheless far excelled by those of ELORA. See below. The excavations of the TEMPLE OF SALSETTE, also near Bombay, are of a similar character to those on the island of Elephanta, nor should we omit to notice that splendid modern monument, the MAUSOLEUM OF HYDER ALLY, in the great garden of Seringapatam. The whole of this sumptuous edifice, together with its dome, is supported by brilliantly polished black marble columns.

The WONDERS OF ELORA consist of several temples and dwellings excavated out of a mountain of granite, and extending upwards of a mile and a quarter. They are situated a short distance from the rural village of ELORA, which is embosomed in a grove of trees, and inhabited by Brāhmans. Elora is itself in the neighbourhood of the fortress of Dowlatabad in the Deccan of Hindoostan. It appears to be one of the chief seats of the Hindoo priesthood.

Conceive the surprise at suddenly coming into a stupendous temple, within a large open court hewn out of the solid rock with all its parts perfect and beautiful, standing on its native bed, and detached from the mountain by a spacious area all round nearly 250 feet deep, and 150 fect broad! The temple itself rearing its rocky head nearly 100 feet high, its length about 145 feet, by 62 broad, with well formed doorways, windows, staircases, and its upper floor containing fine large rooms of a smooth and polished surface, regularly divided by rows of pillars; the whole bulk of this immense block of isolated excavation being upwards of 500 fect in circumference; and beyond its areas are three handsome figure galleriers or varandas, supported by regular pillars with compartments hewn out of the boundary scarp, containing forty-two curious gigantic figures of the Hindoo mythology; the whole three galleries in continuity closing the areas, and occupying the almost incredible space of nearly 420 feet of excavated rock. Within the court stands "KEYLAS *the Proud*," a mighty fabric of rock, surpassed by no relic of antiquity in the known world. Thus writes Captain SEELY, who some years since visited these singular monuments and temples of the Hindoo religion. Many other temples at Elora deserve attention; such are TEEN TAL, and the arched temple of Visvacarma, a singular and unique piece of incredible labour, and enough of itself to give fame to any country. Besides the gods of the Hindoo mythology, figures of monkeys and peacocks are carved in many of these temples, which are still used for the purposes of religion. When these temples, &c. were excavated, does not appear with any certainty known.

The GREAT WALL OF CHINA, which is conducted over mountains, some of them nearly a mile high, across deep valleys and over wide rivers by means of arches, deservedly ranks among the stupendous efforts of art. It extends, on the northern boundaries of China, a distance of about 1500 miles. It varies in height and thickness; near Koopekoo it is twenty-five feet high, and at the top fifteen feet wide; at the distance of every hundred yards is a tower or massive bastion; some of the towers are forty-eight feet high, and about forty feet wide. Granite is employed in the foundation and angles; but the materials consist mostly of bluish bricks, and the mortar is very fine and white. Some assert that this wall is two thousand years old; but there is reason to believe that it has not been built one fourth

of that time. It was designed as a barrier against the incursions of the Mongul Tatars.

The PORCELAIN TOWER at Nankin, is so called because its coating is made of porcelain. Its use does not appear exactly known. It is about 200 feet high. The Pagoda in Kew Gardens will give a good idea of this tower.

On the RUINS OF GREECE our limits compel us to be brief. Among them we must, however, notice the lofty rocks of the ACROPOLIS at ATHENS, crowned with the ruins of those majestic temples, the PARTHENON, the ERECHTHEUM, &c.; and, at modest distance, the TEMPLE OF THESEUS, the TEMPLE OF JUPITER OLYMPUS, &c., displaying, in exquisite sculpture, the taste and knowledge of Grecian art two thousand years ago.

Go we thence to *Rome*, once the mistress of the world, and behold a monument of her power, of her faded glory, of her knowledge, and her art, in the

RUINS OF THE COLISEUM, that vast amphitheatre which would hold, it is said, from 80 to 100,000 spectators; it consisted of four tiers of arcades, adorned with columns of the four orders, the Doric, Ionic, Corinthian, and Composite. Thirty thousand captive Jews are said to have been engaged by Vespasian in the construction of this edifice. It was not, however, finished till the reign of his son Titus; who, on the first day of its being opened, introduced to the arena not less than 5000, or, according to Dion Cassius, 9000 wild beasts, between whom and the primitive Christians, held captive by the Romans, combats were fought. Alas! for the folly and cruelty of such besotted emperors!

TRAJAN'S PILLAR was erected at Rome by the Emperor Trajan, to commemorate his victories over the Dacians in the year 114. It is considered as a master-piece of art, chiefly from the beautifully wrought bas-reliefs, about 2000 figures, with which it is ornamented. It stands in the middle of a square; and is built of white marble; within-side is a stair-case illuminated by 44 windows: it is 140 feet high.

The PANTHEON is the most perfect of the Roman temples which now remain; and, notwithstanding the depredations of Goths, Vandals, and Popes, is still a beautiful monument of Roman taste.

We can only name other *Roman* ruins: the *Antonine Column*, the ROMAN AMPHITHEATRE at *Nismes* the MAISON CARREE at the same place; and the PONT DU GARD, a celebrated aqueduct built by the Romans, about three leagues from the same city.

Of ancient monuments of art in this country the oldest is, beyond all controversy, STONE HENGE, which stands in the middle of a flat area near the summit of a hill six miles north of Salisbury. It is enclosed by a double circular bank or ditch nearly thirty feet broad, after crossing which an ascent of thirty yards leads to the work. It originally consisted of two circles, and two ovals; the outer circle is about 108 feet in diameter, and, when entire, contained sixty stones, thirty uprights and thirty imposts, of which there now remain twenty-four uprights only, seventeen standing, and seven down, and eight imposts. These stones are from thirteen to twenty feet high. The smaller circle contained much smaller stones; a few only remain standing. The *adytum* or cell is an oval formed of ten stones, from sixteen to twenty-two feet high, in pairs, and with imposts above thirty feet

high. Within these are other smaller stones, a few only of which are standing. At the upper end of the *adytum* is the altar, a large slab of blue coarse marble twenty inches thick, sixteen feet long, and four broad. The number of stones, uprights and imposts, comprehending the altar, is 140. The stones are now generally believed to have been transported by some means, massive as they are, from those called the *Grey Weathers* on Marlborough Downs, distant about fifteen miles. Of the history of Stone Henge nothing is with certainty known; the general opinion is that it was a Druidical temple.

Many remains of similar monuments of ancient art exist; one, the stones of which are now nearly all removed, is at Avebury, a few miles from Marlborough; near which also is SILBURY HILL, a huge artificial mound which has much puzzled our antiquarians.

One of the most splendid productions of art since the Christian era is, beyond question, that of the cathedral dedicated to ST. PETER, at Rome; it is 730 feet long; in breadth 520 feet, and in height 450 feet. It was begun in 1506, and finished in 1621; and is entirely covered, both within and without with marble.

We could proceed much further in our detail of the wonders of modern art; but we must forbear. He who is desirous of gratifying a laudable curiosity, will find much in the history of the MINES of this country, whether of SALT, of COAL, of COPPER, of LEAD, of ZINC, or of IRON; much in the IRON MINES of *Sweden*, in the QUICKSILVER mines of *Hungary* and *Idria;* much in the SILVER MINES of *Potosi* and *Mexico;* much in the contemplation of the EDDYSTONE LIGHTHOUSE, the stupendous BREAKWATER in *Plymouth Sound;* the SUSPENSION BRIDGE at *Hammersmith;* much at the BRITISH MUSEUM, both of *Nature* and of *Art*, in which he will be interested; much in innumerable other objects and processes in the arts, which modern ingenuity and skill have brought to an astonishing degree of perfection, and with which he cannot fail to be, at once, instructed, surprised, and amused.

SCHOOLS, ACADEMIES, LITERARY INSTITUTIONS, COLLEGES, UNIVERSITIES, LEARNED SOCIETIES, ETC.

HAVING in our preceding sections treated of the most important arts and sciences, except THEOLOGY, which will follow in the next section, it may be here appropriate to notice the chief of the means by which a knowledge of the arts and sciences can be best obtained. And first of the

SCHOOL, a term anciently used for a place where several persons met together, either to study, to converse, or to do any other matter; but it now implies a place of discipline or instruction of any kind. Sometimes, indeed, a city is called a school, as London, Paris, and Edinburgh are, respectively, celebrated schools of medicine; implying, of course, that medicine is taught in each of them with great success. The term school is, however, usually applied in a more general sense. Schools are either public or private. Public schools are those in which the languages and some of the sciences are taught; such are the *Charter-House*, *Saint Paul's*, *Westminster*, and *Christ's Hospital* schools in London; and *Eton*, *Winchester*, *Harrow* and many other schools in the provinces. Many of such schools are richly endowed. Private schools in this country are innumerable. Indeed so extensive has the

diffusion of knowledge become, that there is scarcely a village in the kingdom that has not a school in which, at least, the arts of reading and writing, and a knowledge of arithmetic are not taught; and although a knowledge of these is merely the threshold to that of other and more important FACTS, yet as, without them, the human mind would be, comparatively, a blank, as first steps in entering the temple, they are by no means to be neglected. From such schools to those which direct to the deep recesses of science and of learning, the gradations are many; and the acquirement and tact of the teachers numerous and varied. In regard to the methods of teaching in schools, Dr. BELL and JOSEPH LANCASTER much excited the public attention some years since; both of whom proposed more expeditious methods of acquiring the art of writing, &c. than were before known; children being, in the first instance, taught the letters of the alphabet by forming them with their fingers in sand. These methods have, since their first promulgation, been combined and improved. To many schools where learning and elegant accomplishments are taught, the name of

ACADEMY, a very indefinite term, is now given; the origin of the word academy is stated in page 379; and although

LITERARY INSTITUTIONS are not exactly upon the usual plan of many other academies, yet as useful means of instruction in many of the arts and sciences, they may, with propriety, be considered under this head. We have already alluded to these establishments in page 28; and therefore there will be less occasion to enlarge upon their merits here. To the honour of the metropolis we must add that, besides the MECHANICS' INSTITUTION, lately established under the patriotic Mr. BROUGHAM, Dr. BIRKBECK, and other friends to the diffusion of knowledge, there are now the ROYAL INSTITUTION, incorporated in 1800, and at which the discoveries of Davy were made; and where Messrs. BRANDE, FARADAY, and MILLINGTON lecture, besides, occasionally, other eminent professors; the LONDON INSTITUTION, incorporated in 1807; a splendid literary establishment at which also many intelligent professors lecture: the RUSSELL INSTITUTION; the WESTERN INSTITUTION; and the CITY OF LONDON INSTITUTION, should also be mentioned. Of *provincial* institutions, one of the chief is the *Royal Institution* of LIVERPOOL, where the presiding genius of Roscoe has done so much for the general diffusion of knowledge; to this may be added the Institutions of BRISTOL, of BATH, of PLYMOUTH, of PORTSMOUTH, of NORWICH, of SHEFFIELD, of LEEDS, of NEWCASTLE-UPON-TYNE, besides others diffused over the empire, which we cannot name. To these may be appended more than *fifty Mechanics' Institutes*, spread over the land, and pouring out their streams of knowledge in every direction.

COLLEGE, besides having many other meanings, is usually understood as a public place endowed with certain revenues, where the languages, the sciences, and some of the arts are taught. An assemblage of several colleges constitutes a *university*. See the next article. College is also used for an establishment designed to teach some particular art or science: thus we have the *College of Physicians*, the *College of Surgeons*, the *Veterinary College*, &c. College also implies a community where a number of persons live by one common rule; sometimes a cathedral.

UNIVERSITY, a corporation for the education of youth in the languages and the liberal arts and sciences; and the directors of

which have authority to admit students in it to certain *degrees* in the different sciences, which serve as certificates of proficiency, and also confer on those who obtain them considerable privileges within the university, as well as some rank in the state without it. A university generally contains one or more colleges, endowed with permanent revenues in lands, &c. In most universities there are four *Faculties;* namely, *Theology*, *Law*, *Physic*, and *The Arts and Sciences*, which comprehend mathematics, natural and moral philosophy, &c. In Oxford, Cambridge, and some other universities, *Music* is considered as a *fifth* faculty. The universities in the United Kingdom were, till lately, the following; *Oxford*, *Cambridge*, *Edinburgh*, *Glasgow*, *Aberdeen*, *St. Andrew's*, and *Dublin*. Each of these consists of one or more colleges: Oxford has twenty colleges and five *halls;* Cambridge has seventeen colleges, and Dublin only one. The *head* or superior officer in each of these is generally a *Doctor of Divinity*, and is styled *Master*, *Warden*, *Rector*, *Provost*, *Principal*, *President*, or *Dean*, as the case may be. Besides these, are numerous FELLOWS and PROFESSORS, who teach the various sciences. The government of the whole university in Oxford and Cambridge consists of a *Chancellor*, *High Steward*, *Vice-chancellor*, &c. The Chancellor and High Steward are usually some noblemen; the Vice-chancellor, a head of some college. The students are of several kinds, *Gentlemen* or *Fellow Commoners*, *Commoners*, *Pensioners*, *Scholars*, and *Servitors* or *Sizars;* but our limits prevent us from explaining these different ranks.

The universities of Oxford and Cambridge may claim, perhaps, the highest antiquity of any in the world; University College in Oxford was founded as early as the year 872. The chief degrees conferred at Oxford and Cambridge are *Bachelor* of *Arts*, of *Laws*, of *Divinity*, &c.; *Master of Arts; Doctor of Divinity*, of *Physic*, of *Laws*, of *Music*, &c. Before these degrees are conferred, the student must have kept a certain number of terms, and undergone certain examinations for each degree respectively. Nor can a clergyman hold two livings unless he has taken the degree of Master of Arts, or Bachelor of Laws, in one of our universities; nor can he be a Bishop till he has taken a Doctor's degree; nor a Physician till he has taken the degree of Doctor of Physic, &c.

The UNIVERSITY OF LONDON, lately established, must not be omitted in our notice of such learned associations. It was opened for the admission of students in the autumn of last year, and its success, hitherto, promises for it a brilliant career. The number of pupils attendant on the lectures of the different professors are already numerous, approaching to, we believe, a thousand. It is composed of shareholders, from whom is elected a *council*, who manage the affairs of the university, appoint the professors, &c. &c. From the list of subjects, and the professors who lecture on them, it is evident this university takes a large range, far exceeding what is taught at Oxford or at Cambridge, with one exception, THEOLOGY; which, as the university is intended for all classes and sects—Jew and Gentile,—could not be admitted without compromising the principles on which it was established, namely, that it should be open to persons of any religion, without distinction. It is not to be inferred, however, from this that the London University is an irreligious establishment: far from it. Many of its professors are members of the Established Church, and many of its patrons and supporters belong also to the same commun-

ion. Such are the DUKE of SOMERSET, the MARQUIS of LANSDOWN, Mr. BROUGHAM, &c. &c. LEONARD HORNER, Esq. is the Warden of this university. We ought not, in passing, to omit a notice of

KING'S COLLEGE, for which nearly 130,000*l.* have been already subscribed towards its establishment in this metropolis, which, as far as we can learn from what has been made public concerning it, will be similar in plan and in the range of education, to the London University, with the single exception, that it is designed to teach, in theology, the principles of the Established Church.

The BRITISH MUSEUM has been noticed in pages 338 and 399. It contains, besides a large *Library*, almost innumerable *specimens*, both of *Nature* and *Art*;—from the Colossal head of Memnon to the smallest medal; from the petrified human body to the minutest shell; from the humming bird to the eagle and many other animals; gems, ores, and a splendid *et cœtera;* all open to the public, *gratis*, under suitable regulation. It is a valuable and important *National Establishment.*

ROYAL SOCIETY of LITERATURE. This Society was established about seven years since, under the immediate patronage of his Majesty. Besides the occasional publication of *Transactions* and the bestowal of *Rewards*, honorary and pecuniary, the liberality of the King is strikingly exemplified in an annual grant of 1000 guineas to *ten* Royal Associates, who receive annually, during their lives, 100 guineas each. The gentlemen elected to this honour in 1824 were, Mr. COLERIDGE, the Rev. EDWARD DAVIES, Dr. JOHN JAMIESON, Rev. Mr. MALTHUS, Mr. MATTHIAS, Mr. MILLINGEN, Sir. WILLIAM OUSELEY, Mr. ROSCOE, Rev. Mr. TODD, Mr. SHARON TURNER; all more or less distinguisued in various departments of literature.

Of other LITERARY and SCIENTIFIC SOCIETIES in this country our notice must be brief. The ROYAL SOCIETY, established in 1662, is well known; the ROYAL ACADEMY OF PAINTING, established in 1768, has been mentioned before in page 335; the ANTIQUARIAN SOCIETY was instituted in 1751; the SOCIETY OF ARTS, in 1753; since which have been established the LINNEAN SOCIETY, for the encouragement of *Natural History* generally, and of *Botany* in particular; from which have lately branched off the HORTICULTURAL SOCIETY, and the ZOOLOGICAL SOCIETY, whose *Gardens* in the *Regent's Park*, containing numerous specimens of living animals, excite much public interest. The GEOLOGICAL SOCIETY and the ASTRONOMICAL SOCIETY should also be noticed. Nor, perhaps, ought we to omit naming the ROYAL COLLEGES OF PHYSICIANS and SURGEONS, both ancient establishments, and of considerable importance to the profession and to the public.

The *Society for the Diffusion of Useful Knowledge* was established in the metropolis about two years since. Some of the most able and intelligent of our *literati* are among its members. There have been published, and are still in course of publication under its superintendence, numerous treatises on the most useful and interesting subjects, at a cheap price. Of provincial literary societies, however respectable, as well as of the universities and institutes of foreign countries our limits forbid notice; yet we cannot avoid observing that the

NATIONAL INSTITUTE at Paris is a great and learned association, and reckons among its members some of the most eminent men in the republic of letters and of science.

The SORBONNE was formerly the house or college of the faculty of theology, in the University of Paris. The term was also used for the whole faculty of theology at Paris, because the assemblies were held in the house of the Sorbonne. At the Revolution this institution was abolished.

GRADUATE is a person who has taken a degree in any of the arts or sciences taught at a university.

BACHELOR, in the university, denotes a person who has taken the lowest degree in the liberal arts and sciences. Before a person can be admitted to the degree of *Bachelor of Arts*, at Oxford, he must have studied there four years; three years more to become *Master of Arts*, and seven more to commence *Bachelor of Divinity*. At Cambridge nearly the same rule is observed. The degree of *Bachelor of Law* may be obtained after having studied *six* years at Cambridge, or *seven* at Oxford.

MASTER OF ARTS. See the preceding article.

DOCTOR, a person who has passed all the degrees in any learned art or science, and is empowered to teach or practise the same. The title of *Doctor*, as an academic distinction, was first adopted about the middle of the twelfth century. To obtain the degree of *Doctor* in *Divinity* at *Oxford*, the candidate must have been four years Bachelor of Divinity; for *Doctor of Laws*, twelve years must be spent at the university—seven for a bachelor, and five for a doctor: or, otherwise, in three years after taking the degree of Master of Arts he may take the degree of Bachelor of Law, and in four years more that of Doctor of Laws; which same time and method are required to obtain the degree of *Doctor of Physic*. At *Cambridge* for a Doctor of Divinity the candidate must have been seven years Bachelor of Divinity; although, in some of the colleges, the taking of a Bachelor of Divinity's degree is dispensed with, and the candidate may go out *per saltem*. To be Doctor of Laws the candidate must have been five years Bachelor of Law, or seven years Master of Arts. To be a Doctor of Physic, he must have been a Bachelor of Physic for five years, or seven years Master of Arts. No physician, can, however, practise in London, nor within seven miles thereof, without a license from the Royal College of Physicians of London. See page 313.

FELLOW, a term used for a member of several learned societies; thus, we have *Fellow* of the *Royal* or *Linnean Society*, &c. In universities the FELLOWS with the MASTER constitute the chief persons in a college. Fellows of colleges have many privileges; they are sometimes the *tutors*; they frequently, also, succeed to livings; and when residing in the university, are usually supported by it.

ABBE, in a monastic sense is the same as *Abbot*, but has been used in France for about a century and a half for an academic person who has not yet obtained any fixed settlement either in church or state, but who wishes for and would accept either. Abbés were, of course, admissible into the best companies; and often tutors in colleges and private families. The term *Abbe* is rarely now heard of or used.

Theology.—Religion.—Religious Officers and Distinctions.—Religious Societies.—Religious Sects and Denominations.

THEOLOGY or DIVINITY is that science which instructs us in the knowledge of God and divine things; which shows us what

we are to believe of God, and the manner in which he would be served. It consists of two kinds—*natural* and *supernatural.* The first is the knowledge we have of God from his works, by the light of nature and reason ; the second is that which we learn from revelation. Theology has been, besides, subdivided into *positive*, being the knowledge of the Scriptures, and the signification of them conformably to the the opinions of the Fathers and Councils, without the assistance of argumentation : by some this is also called *expositive ; moral*, relating to manners and actions, in contradistinction to *speculative*, which explains the doctrines of religion as objects of faith. There are many other divisions, which we need not enumerate.

The *Theology of the Ancients* has been explained under *Mythology*, in page 375, to which the reader will refer.

RELIGION (from *religio*, Lat. literally "a fast tie,") a system of faith and worship, by which the conduct and behaviour are regulated and influenced. The difference between the terms theology, or divinity, and religion is this : theology considers religion as a science, to be taught similarly to other sciences ; religion is a more popular term, and is applied to all faiths, whether Christian or otherwise. Many of the most unlettered nations have some religion, but no theology. Among the numerous religions which now exist in the world, the most rational and pure is, beyond question, the CHRISTIAN. It is scarcely necessary for us to observe, that the founder of Christianity was JESUS CHRIST ; and that the NEW TESTAMENT contains the history of his life, his miracles, his death, and resurrection. The *New Testament*, together with the OLD, forms, therefore, the *Code of the Christian Religion.*

The *History of the Christian Church*, from its first establishment to the present time, is full of curious and instructive matter ; we cannot even exhibit an epitome of its principal events ; but may just observe, that although some of the most eminent fathers of the church were called *bishops*, and sometimes *papa* or father, yet the term *Pope*, as the general head of the Christian church, was unknown till about the latter end of the eleventh century, when it was assumed by the Bishop of Rome. For many centuries, most of the inhabitants of Europe bowed to the spiritual dictation of this Roman father; yet at length, in the sixteenth century, a REFORMATION took place, the human mind shook off its trammels, and powerful advocates arose in LUTHER and CALVIN, to give an impulse to thought and an independence to the individual. Our subsequent account of *Religious Officers*, *Distinctions* and *Sects*, will shew, in part at least, the consequences of the change.

RELIGIOUS OFFICERS, DISTINCTIONS, SOCIETIES.

APOSTLE, (from *αποστολος*, *apostolos*, Gr.) properly signifies a messenger, and hence, by way of eminence, denotes one of the twelve disciples commissioned by JESUS CHRIST to preach the gospel. The Apostles, after preaching some time in Palestine, determined by lot what part of the world each should take ; and thus, by their dispersion, Christianity was very early planted in many parts of the world.

FATHERS of the CHURCH are generally considered those who lived and wrote during the first ages of Christianity ; such are *Origen, Polycarp, Chrysostom, Eusebius, Athanasius*, &c. &c.

The KING, in this country, is the head of the Established Church: to him belongs the nomination of archbishops and bishops; and of appointing convocations of the clergy; to him also belong the presentations to numerous benefices, &c. &c. but these last are in the patronage of the Lord Chancellor.

The POPE, from *Papa*, is the supreme head of the Romish church. It is said, however, that the title of Pope was anciently given to all bishops; but Gregory the VIIth first appointed, in a synod held at Rome in the eleventh century, as above stated, that the title of Pope should be restrained to the Bishop of Rome, as a particular distinction and prerogative. This distinction has been ever since retained, except for a few years during the French Revolution, when the popedom was, for that time, abolished. In the Lateran Council, held under Innocent III., the Pope was declared *ordinary* of *ordinaries*. He is chosen by the cardinals out of their own body. His see is at Rome, whence his orders, called briefs and bulls throughout the catholic world, issue. Mention is made in history of a popess *Joan*, but the reality of the existence of such a personage is now incapable of proof. The Pope's *bull* is a letter written on parchment, and sealed with lead, by which it is partly distinguished from a brief: it is a sort of edict: if in a matter of *justice*, the lead is suspended by a hempen cord, if of *grace*, by a silken thread: it is this pendant seal which is properly the *bull;* impressed on one side of which are the heads of St. Peter and St. Paul, on the other is the name of the Pope; bulls are granted for the consecration of bishops, the promotion of benefices, the celebration of jubilees, &c. A *golden bull*, made by Charles IV. Emperor of Germany, was so called because it had a gold seal. The Pope has the title of *Holiness*. The papal crown is described in page 220.

CARDINAL, a prince in the Romish church, who has a voice in the conclave at the election of a Pope. The cardinals constitute a college; they consist of seventy in number. Growing in authority as their head, the Pope, grew, they became at length *superior to the bishops*. The dress of a cardinal is a red soutanne, a rocket, a short purple mantle, and a red hat. See page 223.

ARCHBISHOP, the name of the first class of church dignitaries in this country. Archbishops were first known in the East as early as the year 320. Athanasius is said to be the first who used the title. It was not till late that archbishops became metropolitans, and had suffragans under them. The ecclesiastical government of England is divided into the provinces of *Canterbury* and *York*. To the first belong *all* the bishops, except *Carlisle*, *Chester*, and *Durham*, *Sodor and Man*, which are in the province of York. The *Archbishop of Canterbury* is the first peer of the realm, and, next to the Royal Family, has precedence of all dukes and great officers of the crown. It is his privilege by custom to crown the kings and queens of this kingdom. He may retain and qualify eight chaplains, a duke being allowed only six. He issues special licences to marry, and to hold two livings; and has the right of conferring degrees. The *Archbishop of York* has the like right in his province as the Archbishop of Canterbury; he has precedence of all dukes not of the blood royal; and of all state officers except the lord chancellor. Both the archbishops are members of the House of Lords. See pages 223, 224 and 240.

BISHOP, a prelate or person consecrated for the spiritual govern-

ment of a diocese. The word is from the Greek, *επισκοπος*, *episcopos*, an overseer, corrupted in Saxon to *bishop*. A bishop differs from an archbishop, in that an archbishop, with bishops, consecrates a bishop, as a bishop, with priests, ordains a priest; and while the archbishop superintends a province, the bishop only a diocese;—the archbishop has canonnical authority over all the bishops of his province, as the bishop has over the priests in his diocese. The bishops of England are members of the House of Lords and have precedence of all barons, they sitting there both as barons and as bishops. Bishops have two special privileges next to regal: they sit and pass sentence of themselves, and by their own authority, the bishop's courts not being like other courts, but writs are sent out in their name *teste* the bishop, and not, as in other courts, in the king's name. Like the king too, they can depute their authority to another, as to their suffragan, chancellor, commissary, &c. Into whatever Christian country they go, their episcopal degree and dignity are acknowledged; in this also differing from lay lords. They vote in the trial and arraignment of a peer; but on sentence of death, &c. they withdraw and vote by proxy. They are privileged from arrest, outlawries, distress, &c.; have liberty to hunt in the king's forest; and have certain tuns of wine duty free, &c. Their persons cannot be seized, as lay peers may, upon contempt, but their temporalities alone. They may qualify as many chaplains as a duke, *six*. The BISHOPRICKS have temporal revenues of greater or less extent: those of *Durham* and *Winchester* are princely. See pages 223, 224, and 240.

An ARCHDEACON is next in dignity to the bishop; he is usually appointed by the bishop himself, and has a kind of episcopal authority originally derived from the bishop, but now independent and distinct from his. He therefore visits the clergy and has his separate court for punishment of offenders by spiritual censures, &c. There are in England sixty archdeacons.

DEAN, a dignitary in most cathedral and collegiate churches, he being usually president of the Chapter. He is called *dean*, *decanus*, the Greek, *δεκα*, *deca*, signifying ten, as being supposed to preside over, at least, ten canons or prebendaries. In England there being two foundations of cathedral and collegiate churches, the *old* and the *new*, (the latter being those founded by Hen. VIII. on the suppression of the abbots and priors, when their convents were turned into dean and chapters,) so there are two ways of creating deans: the first way is similar to that of a bishop, by the king sending out his *conge d'elire* to the Chapter, who choose, the king giving his assent, and the bishop confirming him and giving his mandate to instal him. In the last he is installed simply by the king's letters patent, without either election or confirmation.

The DEAN and CHAPTER are the bishop's council to assist him in the affairs of religion. The *Chapter* consists of the canons and prebends of the cathedral. The CHANCELLOR of the cathedral is an officer who, besides other functions, applies the seal and writes and despatches the letters of the chapter.

CANON, one who possesses a *prebend* or revenue allotted for the performance of divine service in a cathedral or collegiate church. It is said that the name canon was not known before the time of Charlemagne; canons are of various kinds, as *Cardinal*, *minor*, &c.

PREBENDARY or PREBEND, an ecclesiastic who enjoys a pre-

bend. See the last article. The difference between a prebendary and a canon is, that the former receives his prebend in consideration of his officiating in the church, the latter merely by his being received into the cathedral or college.

A RECTOR is the clergyman or parson who has the cure of a parish, and possesses all the tithes, both great and small. Sometimes the predial or *great* tithes are in lay hands, in which case they are called *impropriated;* and sometimes they are in those of an ecclesiastical community, when they are termed *appropriated*, and then the parson is called

The VICAR. Tithes were originally the property of the rector; but several rectories have, from time to time, been converted into *vicarages;* that is, the tithes have been divided, and the *great* tithes, such as corn, hay, and what is most valuable, have been appropriated to the use of bishops or other persons, and the *smaller* tithes, as milk, fruit, &c. have been settled on the clergyman who serves the church, hence called *vicar*. But in some places the vicarage has been considerably augmented by a large share of the great tithes. See page 260.

INCUMBENT implies the clergyman, whether rector or vicar, of a church or benefice.

The CURATE represents the incumbent of a church, and officiates at divine service in his stead; and in case of pluralities of living, where a clergyman is old and infirm, it is requisite that there should be a curate to perform the duties of the church. He is to be licensed and admitted by the bishop of the diocese, or an ordinary having episcopal jurisdiction.

A PERPETUAL CURATE is one who is appointed where the tithes are impropriated and no vicarage endowed; he is not removable; some *perpetual curacies* have portions of the tithes settled upon them.

The laws relative to curates were some time since altered and improved for their benefit, but we cannot detail the change.

PRIEST, in the church of England, the order above a deacon and below a bishop. A priest is competent to perform all the offices of the church. The office of

A DEACON, according to the form of his ordination, is to baptize, preach, and assist in the administration of the Lord's Supper; and, in short, to perform all the other offices of the liturgy which a priest can do, except that of consecrating the elements of the Lord's Supper and pronouncing the absolution. No person can be ordained a deacon under the age of twenty-three years, unless by special dispensation, &c. No person can be admitted to any benefice or ecclesiastical promotion till he is ordained priest. In the church of Scotland the deacon's office only requires him to take care of the poor.

CLERK, in legal language, a clergyman of the Established Church. Clerk is also a layman who reads the responses of the congregation in the church to direct the rest. In London there is a *Company of Parish Clerks*, under whose direction the bills of mortality are kept.

SEXTON, (corrupted form *sacristan*,) a church officer, whose business it is to take care of the vessels, vestments, &c. belonging to the church, and to attend the minister, churchwardens, &c. at church; he has also the management of the bells.

APPARITOR, a messenger who serves the processes of a spiritual court, or a beadle in a university who carries the mace.

VERGER, in cathedrals, &c. is an officer who carries a rod tipped with silver before the bishop, dean, &c.

ADVOWSON is the right of patronage or presentation to a vacant benefice. Appendant advowsons are those which depend on a manor or lands, and pass as appurtenances to the same. *Advowson in gross* is a right of presentation subsisting by itself belonging to a person, and not in lands. In both cases they are as much the property of the patrons as their landed estates, and may be granted by deed or will, and are assets in the hands of executors.

A LIVING or CURE is the benefice itself in any parish of which the incumbent has the charge.

For TITHES, see page 260, and RECTOR and VICAR above.

CHURCH, an assembly of persons united by the profession of the same Christian faith and the participation of the same sacrament. In England the King, and, with Roman Catholics, the Pope, are respectively the heads of the church. Church is sometimes applied in a more extensive signification—the whole *church of Christ* implying all the professors of christianity. The *church militant*, the *church triumphant*, the *church patient*, and the *church faithful*, are also occasionally used. The church is, moreover, divided into several grand sections. Thus we have the *Greek church*, the *Latin, Roman Catholic or Western church*, the *Protestant church*, &c.

The GREEK or EASTERN CHURCH comprehends the churches of all the countries anciently subject to the Greek or Eastern Empire, and through which its language was carried, which comprehends thespace extending from Greece to Mesopotamia and Persia, and thence to Egypt, including also, at the present time, the whole, or nearly the whole, Russian empire.

The LATIN, WESTERN CHURCH, or ROMISH CHURCH, comprehends Italy, France, Spain, Africa, the north and all other countries whither the Romans carried their language. But Great Britain, part of the Netherlands, Germany, and the North, have been separated from this church since the time of Hen. VIII, and constitute what is called the reformed church, which is again divided into the Lutheran, the Calvinistic church, &c.

Church is also used for a Christian temple, consecrated to the service of God commonly under the name of some particular saint.

Catholic Church, in its literal acceptation, means the universal or general church; but the Romish church is distinguished by the name of *Catholic*, in opposition to all those who have separated from her communion, whom she considers as heretics and schismatics, and herself only as the true Christian church.

CATHEDRAL, derived from the Greek, and signifying *chair*, is the church belonging to a bishop's see or seat. *Cathedral* is supposed to have originated from the manner of sitting in ancient churches or assemblies of primitive Christians: in these the elders and priests were called *Presbyterium*, and where the bishop presided as chairman; *cathedralis* or *cathedralicus*, a cathedral was, therefore, originally different from what it is now: it being at first nothing but a consistory or spiritual court.

Of CHAPELS there are several kinds. *Parochial chapels* differ chiefly in name from parish churches. *Chapels of ease* are usually built in large parishes where all the people cannot attend the parish church. *Domestic chapels* are those of noblemen and others for the

private worship of God. The word chapel is derived from the Latin, *capella;* and in former times, when the kings of France were engaged in war, they always carried St. Martin's *chapeau*, or hat, in the field, which was kept in a tent as a precious relic: hence the place was called *Chapelle.*

CHAPLAIN is a clergyman who officiates in a chapel; the term is, however, applied to those clergymen who are appointed to perform religious services for the king and royal family. Such are the *chaplains in ordinary;* or *domestic* chaplains, those who perform the same functions in private families, whether noble or otherwise. A chaplain is also one who performs similar functions in charitable institutions, the army, navy, &c.

CONVOCATION, a general assembly of the clergy summoned by the king's writ to consult on the more weighty affairs of the church.

LITURGY denotes all the ceremonies in general belonging to divine service. In a more confined sense it is used in the Romish church to signify the *mass;* and with us the ritual as contained in the book of Common Prayer.

RUBRIC, the directions given at the beginning and in the course of the Liturgy for the order in which the several parts of the office are to be performed. There are several rubrics, as *general, special,* for the communion, for matins, &c. They are called rubrics from *ruber*, Lat. "red," because they were formerly printed in red ink.

SYNOD, a council or assembly of ecclesiastics to consult on matters of religion. General synods meet from all nations; besides these there are national, provincial, and diocesan synods.

CANONICAL, a term applied to those books of the Old and New Testament which are esteemed authentic and divine.

APOCRYPHAL, a term applied to such books as are not admitted into the canon of scripture, being either not acknowledged as divine or considered as spurious. The books so considered, sometimes appeded to the Old Testament, are called the APOCRYPHA.

SEPTUAGINT, LXX, or the Seventy, from *Septuaginta*, Lat. "seventy," a term for a translation of the Old Testament out of Hebrew into Greek, performed by seventy-two Jewish interpreters, in obedience to an order of Ptolemy Philadelphus.

CONSISTORY, the college of cardinals, or the Pope's senate and council, before whom judiciary causes are decided. It is the first court or tribunal of Rome; but it never meets except when the Pope pleases to convoke it. Consistory is also used among the reformed religions for a council or assembly of ministers and elders to regulate their affairs and discipline.

Consistory Court. See DOCTORS' COMMONS.

CONCLAVE, a secret and close assembly of cardinals, in which the popes are elected, and other affairs of the see transacted during the vacancy of the papal chair.

TABERNACLE, among the Hebrews, a kind of building in the form of a tent, set up by express command of God for the performance of religious worship, sacrifices, &c. during the journey of the Israelites in the wilderness; and after their settlement in Canaan, made use of for the same purpose till the Temple of Jerusalem was built.

The *Feast of Tabernacles* was a solemn festival observed by the Hebrews after the harvest, on the 15th day of the month Tisri, to

commemorate the goodness of God in protecting them during their abode in the Wilderness.

Tabernacle is also applied to many places of worship established in this country by the celebrated Whitfield.

SANHEDRIM, (from *συν* and *εδρα*, Gr.) implies a council or assembly. The Sanhedrim was the supreme council among the Jews, in which all the great affairs of religion and policy were transacted.

SYNAGOGUE, the place in which the Jews meet to worship God ; and also an assembly of Jews met to perform the offices of their religion. When synagogues were first used by the Jews is not exactly determined : some say that they are as old as the ceremonial law ; others fix their origin after the Babylonian captivity. But no assemblies of Jews appear to have been *called* synagogues till a little before the advent of the Messiah, who is said to have preached in the midst of the Synagogue.

The TALMUD is a Jewish book, wherein is collected all that relates to the explication of the law. The Jews would never put their traditions, &c. into writing, till they were compelled to it by the destruction of Jerusalem, and they saw themselves dispersed throughout the world. There is the Babylonish Talmud, and the Talmud of Jerusalem ; the former was compiled about 500 years after Christ by the Jews of Mesopotamia, and is in most esteem ; the latter, about the same time, by the Jews at Jerusalem.—The Talmud of Babylon is ususlly read, and most frequently consulted, among the Jews ; so that when they say simply *the Talmud*, they always mean this, never quoting the other without the addition of Jerusalem.

ABBEY, a monastery or religious house, governed by a superior under the title of abbot or abbess. *Abbeys* differ from *priories*, the former being under the direction of an abbot, the latter of a *prior;* but abbot and prior conventual are much alike, differing in little but the name.

A MONASTERY is a convent or house built for the reception of the religious, whether it be abbey, priory, nunnery, or the like ; although the word monastery is *properly* applied only to the houses of monks, mendicant friars, and nuns. The rest are called religious houses. Monasteries were in fact nothing but religious houses, whither persons retired from the bustle of the world to spend their time in solitude and devotion. But they degenerated from their original institution, and obtained large privileges, immunities, and riches. They prevailed greatly in this country before the Reformation, but were wholly abolished in the time of Henry VIII. Abbeys and monasteries have been the repositories, as well as the seminaries of learning ; many valuable books and national records have been preserved in their libraries, the only places where they could have been safely lodged in turbulent times.

MONK, (from *μοναχος*, *monachos*, Gr. "solitary,") anciently denoted a person who retired from the world and devoted himself wholly to God, living at the same time in solitude and abstinence. Such were the hermits and anchorites who withdrew into deserts and lived remote from mankind. Monks were, however, of several kinds. *Solitary*, as those first mentioned ; *sarabites*, or strolling monks, having no fixed residence ; and *cœnobites*, who live in communities in a convent or a monastery, who make vows of living according to certain rules established by the founder, wear a habit which distinguishes

their order, and have a superior who is the head of the convent. Those that are endowed are most properly called monks; and such are, for the most part, the monks of the present time, as those of the Chartreux, Benedictines, Bernardines, &c. The mendicants, or those who beg, are more properly called religious and friars, although the names are frequently confounded.

The CAPUCHINS are a religious order of St. Francis, in its strictest observance. The name is derived from *capuce* or *capuchon*, a stiff cap or cowl which they wear. They are clothed in brown or gray, go always barefooted, and never in a coach, nor do they shave the beard.

FRIAR, (*frater*, Lat. *fra*, Ital. *frere*, Fr., that is, *brother*,) a term common to monks of all orders, founded on this, that there is a kind of *brotherhood* between the several persons of a monastery. Friars are of many kinds: *Augustan*, *Dominican*, *Black*, or *preaching*, *Franciscan*, *Gray*, *Minor*, *Begging* and *Carmelite*, or *White Friars*. The term friar is used in a more particular sense for monks who are not priests: those in orders being usually dignified with the appellation of *Father*.

NUN, (from *Nonna*, Lat.) a woman, generally a virgin, in catholic and some other countries, who devotes herself in a cloister or nunnery to celibacy and a religious life. A NUNNERY is therefore a monastery for religious females.

JESUITS, a religious order founded by *Ignatius Loyola*, called also the *Society of Jesus*. This order rendered itself conspicuous by its missions to the Indies, and other employments relating to the study of the sciences and the education of youth. Loyola, in the year 1538, with some of his companions, mostly from the university of Paris, being at Rome, proposed to make a new order, the plan of which he presented to Paul III. who, after some discussion and delay, confirmed it under the name of the *Company of Jesus*. The order was subsequently confirmed by several succeeding popes, who added to it many new rights and privileges. The chief object proposed by the Jesuits was to gain converts to the Romish church by a profound and artful policy mingled with fanaticism; with this view they dispersed themselves throughout almost every country and nation, and with industry and address advanced the objects of their institution. The order consisted of five classes: professed fathers—spiritual coadjutors—approved scholars—lay brothers, and novices. They had no particular habit; they renounced all preferment and especially prelacy; nor could they receive any unless requested so to do by the pope; this request his holiness occasionally made, so that several cardinals have belonged to the order. It is said that no difficulty was so great which they could not surmount; no danger so imminent that they would not undergo; no crime so shocking that have not been perpetrated by them for the service of their cause. This order was expelled from England by proclamation in 1604, and subsequently from many other states of Europe, till it was suppressed and abolished by Pope Clement XIV. in 1773. Yet in 1814 it was again re-established by the Pope! Loyola was born in Spain in 1491, and died in 1556. It ought to be stated that he was not the author of the pernicious maxims which have since disgraced this order.

INQUISITION, in the church of Rome, a tribunal in several Roman Catholic countries erected by the pope for the examination and

punishment of heretics. It was originally founded by Father Dominic and his followers in the 12th century, who were sent by the pope with orders to excite the Catholic princes and people to extirpate heretics, to search into their number and quality, and to transmit an account of them to Rome. Hence they were called Inquisitors, and hence arose the formidable, and we may add diabolical, tribunal of the Inquisition. A history of the murders committed, and the tortures inflicted by the inquisition is at once hideous and appalling. It is devoutly to be hoped that the knowledge and intelligence of the age will abolish, in every country, so wicked and tyrannical a tribunal, which was put down during the reign of Buonaparte; but we regret to state that it has been again revived, not, we trust, to live long.

Of MODERN SOCIETIES for the furtherance of the Christian Faith in this country, we may just remark that many are in great activity: such are the *Society for Promoting Christian Knowledge*, the *Bible Society*, the *Missionary Societies*, &c. &c. whose zeal and efforts are great and important; that these societies are supported by many persons of the first distinction; and that, by their means, religious and other knowledge, together with many of the blessings of civilization, has been diffused over a large surface among the ignorant, savage, and benighted children of the earth. It is impossible, in passing, not to wish success to such unwearied, disinterested, and benevolent exertions.

We cannot quit these notices of religious societies without adverting to the fact, that, among other errors of the Jesuits and the Inquisition, the ARTFUL SECRECY with which their proceedings are carried on demand strong animadversion. While the *open* association and discussion of numbers are decidedly beneficial to society, nothing can be more mischievous than the *secret*, and therefore irresponsible, machinations of those whose conduct is not exposed to the wholesome restraint produced by the expression of *public opinion*.

The BISHOP'S COURT for the cognizance of ecclesiastical affairs, such as tithes, wills, administrations, &c. is held in each diocese; but the supreme ECCLESIASTICAL COURTS in this country are held in

DOCTORS' COMMONS, London, a building of considerable extent, situated in Great Knight Rider Street, near St. Paul's Church Yard. It is properly a COLLEGE, and was founded by Dr. HARVEY, Dean of the Arches, for the Professors of what is called the CIVIL LAW, residing in London, who all live, as to diet and lodging, in a collegiate manner, whence the name *Doctors' Commons.* By the *civil law* is not, however, to be understood exactly all the laws relating to a civil community, but here, that law comprised in the Institutes, the Code, &c. of Justinian the Roman emperor, with some additions by himself and his successors. This, together with what is called the CANON LAW, a body of Roman ecclesiastical laws derived from the ancient Latin Fathers, and many other sources, and, of course, modifications by the statutes, &c. of this country, constitute the studies and practice of Doctors' Commons. But it should be noted that our courts of common law have the superintendency of the courts of Doctors' Commons, &c. to keep them within their jurisdictions; to determine when they exceed them; to restrain and prohibit any excess; and, in case of contumacy, to punish the officer who executes, and, in

some cases, the judge who enforces the sentence so declared to be illegal. The chief courts held in Doctors' Commons are the following, most of which are called *Spiritual Courts* :—

The PREROGATIVE COURT, for wills and administrations.

The COURT of ARCHES, for appeals from inferior ecclesiastical courts in the province of Canterbury.

The COURT of PECULIARS, a branch of the Court of Arches.

The FACULTY OFFICE, empowered to grant dispensations to marry, &c.

The COURT of DELEGATES, for ecclesiastical affairs : a court of appeal.

The CONSISTORY COURT, which takes cognizance of divorces.

The ADMIRALTY COURT. See page 242.

PROCTOR, in a court of civil or ecclesiastical law, is a person commissioned to manage another person's cause. Proctors of the clergy are the representatives chosen by the clergy to sit in the lower house of convocation. Proctors in a university, are two officers chosen from among the residents, to see good order and exercises daily performed there. Proctor is also a term applied to a person appointed by the rector or other possessor of a living to collect the tithes.

SURROGATE, a person deputed, in ecclesiastical courts, to transact the business of the bishop, &c. such as that of granting letters of administration, licences of marriage, &c. &c.

SIMONY, the crime of trafficking with sacred things. The word is borrowed from Simon Magus, who is mentioned in Scripture as offering to buy the power of working miracles with money. Simony is committed by buying or selling the sacrament, baptism, ordination, benefice, &c. The penalty by our law is, that the corrupt patron shall forfeit the next presentation to the king, and two years' value of the living ; and the corrupt incumbent be for ever disabled from holding the living.

RELIGIOUS SECTS AND DENOMINATIONS.

The word *Sect* is a generic term, comprehending all such as follow the mode of worship enjoined by, and who embrace the opinions of, some divine, or other person, the founder of a religious or philosophical association. The sects of philosophers among the ancient Greeks were numerous ; some of them are mentioned in page 379. We are indebted for many of the following observations to that popular work, *A Sketch of the Denominations of the Christian World*, by the late Dr. JOHN EVANS : those who desire more information on such subjects are recommended to the book itself.

The ATHEIST does not believe in the existence of a God, and can therefore scarcely be ranked as a religious sectary ; his opinions of nature may, however, be considered as his religion. Some atheists have attributed all nature and its astonishing phenomena to chance, or, as it has been sometimes stated, to a fortuitous concourse of atoms ; others, more modest, do not pretend to account for the existence of the material universe, contending that they know nothing about it, but suppose that it has always existed, undergoing occasionally certain changes. One, however, of the most important arguments against atheism is this : we see in all parts of nature, whether we look to the heavens or throughout the earth, evident marks of

DESIGN, of intelligence; and it is difficult, if not impossible, to conceive such design, without a DESIGNER,—in other words God.

The name Atheist is from the Greek terms α and Θεος, which united imply "without God." Lord Bacon in his Essays, observes "that a little philosophy inclineth man's mind to atheism, but depth in philosophy bringeth men's minds about to religion: for while the mind of man looketh upon second causes scattered, it may rest in them and go no further; but when it beholdeth the chain of them confederated and linked together, it must needs fly to providence and duty."

The *sermons* preached at Boyle's lectures, the discourses of *Abernethy* on the divine attributes, and the treatises of Dr. *Balguy* furnish, it is generally supposed, a sufficient antidote to atheism. This last excellent writer thus forcibly expresses himself on the subject: "Every faculty, every object of every faculty, demonstrates a deity. The meanest insect we see, the minutest and most contemptible weed we tread upon, is sufficient to confound atheism. How much more that astonishing variety and multiplicity of God's works, with which we are continually surrounded! Let any man survey the face of the Earth, or lift up his eyes to the firmament; let him consider the nature and instincts of brute animals, and afterward look into the operations of his own mind—will he presume to say or suppose, that all the objects he meets with are nothing but the result of unaccountable accidents and blind chance? Can he possibly conceive, that such wonderful order should spring out of confusion? or that such perfect beauty should be ever formed by the fortuitous operations of unconscious, inactive particles of matter? As well, nay, better, and more easily, might he suppose, that an earthquake could build towns and cities; or the materials carried down by floods fit themselves up without hands into a regular fleet. For what are towns, cities, or fleets, in comparison with the vast and amazing fabric of the universe! In short, atheism offers such violence to all our faculties, that it seems scarcely credible it should ever really find any footing in human understanding." Besides the authors above named, *Bentley*, *Newtom*, *Boyle*, *Maclaurin*, *Ray*, *Derham*, *Locke*, and other philosophers, distinguished for the profundity of their researches, and the extent of their erudition, are to be enrolled among the principle advocates for the existence and superintendence of a Deity.

The DEISTS believe in a God, but reject a written revelation from him. The objections, which some deists have made to revelation, affect not so much the religion of Jesus Christ as laid down in the New Testament, as certain absurd doctrines and ridiculous practices, which have been added to it by the weakness and wickedness of mankind. Reiterated accusations, therefore, of unfairness have been brought against the generality of deistical writers; with this injustice Bolingbroke, Voltaire, and Paine, stand particularly charged. If a THEIST be different from a Deist, it is, that he has not had revelation proposed to him, and follows therefore the pure light of nature.

JUDAISM is the religious doctrines and rites of the Jews. A complete system of Judaism is contained in the five books of Moses, their great lawgiver. The Jewish economy is so much directed to temporal rewards and punishments, that it has been questioned, whether the Jews had any knowledge of a future state. The principal sects among the Jews were the *Pharisees*, who placed religion in external ceremony; the *Sadducees*, who were remarkable for their in-

credulity; and the *Essenes*, who were distinguished by an austere sanctity. The Pharisees and Sadducees are frequently mentioned in the New Testament; an acquaintance with their principles and practices serves to illustrate many passages in sacred history. At present, the Jews have two sects, the *Caraites*, who admit no rule of religion but the law of Moses; and the *Rabbinists*, who add to the law the traditions of the Talmud. The dispersion of the Jews took place upon the destruction of Jerusalem by Titus, the Roman emperor, A. D. 70. The expectation of a *Messiah* is the distinguishing feature of their religious system. The most remarkable periods in the history of the Jews are the call of Abraham; the giving of the law by Moses; their establishment in Canaan under Joshua; the building of the Temple by Solomon; the division of the tribes—their captivity in Babylon—their return under Zerubbabel; and the destruction of their city and temple by the Emperor Titus. Their books of the Old Testament are the most ancient and authentic records extant.

CHRISTIANITY (to which Judaism was introductory) is the last and most perfect dispensation of revealed religion, with which God has favoured the human race. It was instituted by Jesus Christ, who made his appearance in Judea nearly 2000 years ago. He was born at Bethlehem, brought up at Nazareth, and crucified at Jerusalem. His lineage, birth, life, death, and sufferings, were predicted by a succession of the Jewish prophets; and his religion is now spread over a considerable portion of the globe. The evidences of the Christian religion are comprised under—historical testimony—prophecies—miracles—the internal evidence of its doctrines and precepts—and the rapidity of its first propagation among the Jews and Gentiles. The immortal Locke also observes, "Whoever would attain to a true knowledge of the Christian religion in the full and just extent of it, let him study the holy Scriptures, especially the New Testament, wherein are contained the words of eternal life. It has God for its author, salvation for its end, and truth, without any mixture of error, for its matter." Even Rosseau confessed himself struck with the majesty of the Scriptures, and the character of Jesus Christ. See *Paley's Evidences*; and *Watson's Apology*.

As it is not easy to give an account of

Christian Sects

in any *classical* arrangement, we have therefore preferred the *alphabetical* to any other, by which also we demonstrate our rigid impartiality.

ANABAPTIST. See Baptist.

ANTINOMIAN, from two Greek words, *anti*, against, and *nomos*, a law, is one who holds, *that the law is not a rule of life to the believer*. Antinomianism arose at the Reformation; its founder was John Agricola, a disciple of Luther. The late Rev. Mr. Fletcher, vicar of Madeley, wrote Four Checks to Antinomianism, which have been much read. Dr. Crisp and a few other divines seem to defend this doctrine.

ANTITRINITARIAN, one who denies the Trinity, and who teaches that there are not three persons in the Godhead, whether Arian, Socinian, or of any other sect.

ARIAN, a follower of Arius, a Presbyter of the church of Alexandria, about the year 315, who maintained that the Son of God was

totally distinct from the Father; that he was the first and noblest of those beings whom God had created; but that he was inferior to the Father both in nature and dignity; and that the Holy Ghost was not God, but created by the power of the Son; he nevertheless admitted that the Son was the Word, but denied the Word to have been eternal. The Arians were divided into various sects. Arian has been indiscriminately applied, in more modern times, to those who consider Christ as inferior and subordinate to the Father. See SOCINIAN and UNITARIAN.

The ARMINIANS arose in Holland by a separation from the Calvinists, following the doctrines of ARMINIUS, a Dutch divine, born at Oudenard, in 1560. Their principal tenets are, that God from all eternity determined to bestow salvation on those who would persevere to the end in the faith; and inflict everlasting punishments on those who should continue in unbelief and disobedience; that Christ, by his sufferings and death, made an atonement for the sins of all, both generally and individually;—that true faith cannot arise from our nature, since man, naturally corrupt, is incapable of any good thing, and therefore in order to salvation it is necessary that he should be regenerated by the operation of the Holy Ghost; that this divine grace begins and perfects every thing that can be called good in man; that good works are not meritorious, &c. &c. The WESLEYAN Methodists approach more nearly to these principles than any religious body whatever.

BAPTISTS are those who attach particular importance to the *mode* of baptism, maintaining that this ordinance should be administered by immersion only. They also contend that it should be administered to those only who believe in the Christian religion, and whose lives are regulated by its precepts. Baptists are divided into *general* and *particular;* the former being Arminians, the latter Calvinists. Baptists are sometimes called *Anabaptists.*

PÆDO-BAPTISTS are those who contend for *infant* baptism.

The BAXTERIAN (so called from RICHARD BAXTER, a native of Shropshire, born in 1615, and a clergyman of the Established Church) strikes into a middle path between Arminianism and Calvinism. Watts and Doddridge are generally considered Baxterians. Baxter was an acute controversial and practical writer; he died in 1691.

The BROWNISTS are the followers of ROBERT BROWN, a church of England clergyman who lived about 1600. He inveighed against the ceremonies and discipline of the church, separated himself from her communion, and afterwards returned to her bosom. He died in 1630, aged 80.

CALVINISM, the doctrines of CALVIN, and his followers; the chief of these relate to predestination—reprobation—original sin—particular redemption—irresistible grace—regeneration—justification by faith—perseverance—and the Trinity. Calvin considered every church as a seperate and independent body invested with the power of legislation for itself. In France the Calvinists were denominated *Huguenots*, (see below.) In Germany they are confounded with the Lutherans under the name of Protestants. Calvinism is said to be in its greatest purity at Geneva, where Calvin himself was pastor of a church, and there established his discipline. He was, however, born at Noyon in Picardy, in 1509, and educated at Paris under Corderius. But his open avowal of the Protestant faith rendered his stay in France

dangerous; he therefore settled at Geneva. He was, it is said, inflexibly steady, profoundly learned, of exemplary morals, chaste and pious, but nevertheless proud, intolerant, and overbearing, as the hand he had in burning *Servetus* for differing from him in opinion most lamentably shows. His Institutes, written in elegant Latin, contain the principles of his system. He died in 1564. See PREDESTINATION.*

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* As to the "*hand Calvin had in burning Servetus*," it is to be regretted either, that the author has inserted this passage at all, or that he has not inserted with it the circumstances, which would enable the reader to see the conduct of Calvin *in its proper light.*

"The following statement taken principally from the writings of Calvin and the decisions at Dort, compressed in as few words as possible," by Rev. Charles Buck. Theol. Dict. Art. Calvinists, will present a fair view of the outlines of Calvinism in distinction from Arminianism.

1. They (Calvinists) maintain that God hath chosen a certain number of the fallen race of Adam in Christ, before the foundation of the world, unto eternal glory, according to his immutable purpose, and of his free grace and love, without the least foresight of faith, good works, or any conditions performed by the creature: and that the rest of mankind he was pleased to pass by, and ordain to dishonour and wrath, for their sins, to the praise of his vindictive justice.

With respect to the *conditional* predestination admitted by the Arminians, they say that an election upon faith or good works foreseen, is not that of the Scriptures; for that election is there made the *cause* of faith and holiness, and cannot, for this reason, be the *effect* of them. With regard to predestination *to death*, they say, if the question be, Wherefore did God decree to punish those who are punished? the answer is, On account of their sins. But if it be, Wherefore did he decree to punish them rather than others? there is no other reason to be assigned, but that *so it seemed good in his sight.* Eph. i. 3, 4. John, vi. 37. Rom. viii. 29, 30. Acts, xiii. 48. 1 Pet. i. 1. Rom. ix, 15, 16. xi. 5, 6.

2. They maintain that though the death of Christ be a most perfect sacrifice, and satisfaction for sins, of infinite value, abundantly sufficient to expiate the sins of the whole world; and though on this ground the Gospel is to be preached to all mankind indiscriminately; yet it was the will of God that Christ, by the blood of the cross, should efficaciously redeem all those, and those only, who were from eternity elected to salvation, and given to him by the Father.

3. They maintain that mankind are totally depraved, in consequence of the fall of the first man, who, being their public head, his sin involved the corruption of all his posterity, and which corruption extends over the whole soul, and renders it unable to turn to God, or to do any thing truly good, and exposes it to his righteous displeasure, both in this world and that which is to come.

4. They maintain that all whom God hath predestinated unto life, he is pleased, in his appointed time, effectually to call by his word and Spirit out of that state of sin and death in which they are by nature, to grace and salvation by Jesus Christ.

5. Lastly: They maintain that those whom God has effectually called, and sanctified by his Spirit, shall never finally fall from a state of

DISSENTERS, a large body of religious persons of various denominations in this country, who dissent from the worship of the Established Church. Dissenters from the established religion first appeared in the time of Queen Elizabeth, and from the extraordinary purity which they proposed in worship and conduct were called *Puritans.* They were greatly increased by the act of Uniformity in 1662; by which 2000 conscientious ministers were obliged to quit the Established Church, whence they were called *Nonconformists.* Their descendants are now known by the name of *Protestant Dissenters*, and rank under the three denominations, *Presbyterians*, *Independents* and *Baptists.* Many men of considerable talent and learning may be named among the dissenters of this country.

DUNKERS, or TUNKERS, arose about 1724, and formed themselves into a kind of commonwealth, mostly in Pennsylvania. They baptize by immersion, dress like Dominican friars, never shave the head or beard, have different apartments for the sexes, and live chiefly on roots and vegetables, except in their love feasts, when they eat only mutton. Their principal tenets are the mortification of the body, and the denial of the eternity of future punishment. They are commonly called the "Harmless Dunkers."

EPISCOPALIANS, those who contend for a church government, in which bishops are essential; the term is now, however, more especially applied to the members of the *Church of England.* The term is derived from *Episcopus.* See Bishop, page 405.

John Wickliffe, educated at Oxford in the reign of Edward III. was the first person in this country who publicly questioned, and boldly argued against the doctrines of the Romish church. He left behind him many followers called *Wicliffites* and *Lollards*, the last as a term of reproach taken from the Flemish tongue. It is remarkable that in the council of Constance in 1415, the memory and opinions of Wickliffe, who died peaceably at Lutterworth in 1387, were condemned, and soon after his bones were dug up and burnt! a proceeding in his enemies, which, most probably, promoted the cause of reform.

The Church of England separated from the Romish Church in the time of Henry VIII. when Luther began the reformation in Germany. In addition to what is said under *Archbishop* and *Bishop* in page 405, and also in page 240 concerning the *House of Lords*, we may add here, that the benefices of the Bishops were converted, by William the Conqueror, into temporal baronies, so that every prelate should have a seat and vote in the House of Peers. The Established Church of Ireland is the same as that of England, and is governed by four archbishops and eighteen bishops.

Attempts have been occasionally made to amend the articles, the liturgy, and other things which relate to the internal government of the Church of England; and Dr. Watson, the late Bishop of Llandaff,

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grace. They admit that true believers may fall partially, and would fall totally and finally but for the mercy and faithfulness of God, who keepeth the feet of his saints; also, that he who bestoweth the grace of perseverance, bestoweth it by means of reading and hearing the word, meditation, exhortations, threatenings, and promises; but that none of these things imply the possibility of a believer's falling from a state of justification.—Ed.

in a letter to the Archbishop of Canterbury, argues the propriety of a more equal distribution of salary among the different orders of the clergy; but all such attempts have been hitherto unsuccessful, except that some years since a law was passed in favour of curates. But we think there can be no doubt that, in time, the clergy themselves will see the necessity of, and call for such a wholesome change as shall prevent the secession of conscientious persons from the church establishment.

The Church of England has produced from time to time many eminent men.

FIFTH MONARCHY MEN, a set of enthusiasts in the time of Cromwell, who expected the sudden appearance of Christ to establish, on earth, a new monarchy. We read in history of four great monarchies, the Assyrian, Persian, Grecian, and Roman; hence, these persons believing that this spiritual kingdom, of Christ was to be the fifth, were distinguished as *Fifth Monarchy Men.*

FREE-WILL. We have defined the *will* in page 20. If that definition be correct, as we believe it is, much of the dispute concerning what is termed *Free-will* may be, we think, very soon disposed of. We merely notice the term here to observe that while controversialists use such vague and indefinite expressions, it is not probable that they will agree concerning them. See forwards NECESSITY.

GNOSTICS, a sect of some note from the first rise of Christianity, especially in the East. The term is derived from γνωστικος, *knowing*, and was adopted by the sect as if they were the only persons who had the true knowledge of Christianity. At first the Gnostics were the only philosophers of those times, accommodating all their interpretation of scripture to the Pythagorean and Platonian philosophy. Gnostics afterwards was a general term, comprehending various sects which arose in the early ages of the church.

The GREEK or RUSSIAN CHURCH, now spread over the eastern parts of Europe, is very ancient, and bears a considerable resemblance to the Church of Rome. Denying, however, the infallibility and supremacy of the Pope, this church is in communion with the Patriarch of Constantinople. Its chief articles are, the rejection of images, the doctrine of consubstantiation, or the union of the body of Christ with the sacramental element, and the administration of baptism by immersion in water.

HUGUENOTS, a term applied to the French Protestants in 1561, derived, some say, from a gate at Tours named *Hugon*, where they first assembled; by others from their original protest or confession of faith: *Huc non venimus*, &c. On the 24th of August 1572, in the reign of Charles IX. was perpetrated the massacre of St. Bartholomew's day, when 70,000 Protestants throughout France were butchered with circumstances of aggravated cruelty; it began at Paris in the night of the festival of St. Bartholomew, by secret orders from the king, at the instigation of his mother the Queen Dowager Catharine de Medicis. Such atrocities are now equally condemned by all sects of Christians.

INDEPENDENTS or CONGREGATIONALISTS deny, not only the subordination of the clergy, but also all dependency on their assemblies; evey congregation having, according to them, in itself what is necessary for its own government, and is in no way subject to other churches. This *independence* has given rise to the name

of their sect, which has been improperly confounded with the *Brownists:* for, though originally sprung from them, they excel them in the moderation of their sentiments, and the order of their dicipline. The first *Independent* Church in England was established by Mr. Jacob in 1616, though a Mr. Robinson appears to have been the founder of the sect. Most of the Independents are, we believe, in doctrine Calvinistic.

KIRK, a Saxon term signifying the same with church: the word is now used in that sense in Scotland. See PRESBYTERIANS.

LUTHERANISM, the religious sentiments of MARTIN LUTHER, an eminent divine and reformer, born of mean parentage, at Isleben in Saxony, in 1483. He obtained a learned education, and became Professor of Divinity at Wittemberg. In 1517 Leo X. having ordered indulgences to be dispensed to those who would contribute towards the building of St. Peter's Cathedral at Rome, Luther preached not only against the dispensers of those indulgences, but the indulgences themselves, and afterwards, continuing to preach against many other corruptions, he obtained a number of followers, and thus was Lutheranism formed. The real name of Luther was *Lotter* or *Lauther;* he assumed the name of *Lutherus* according to the custom of learned men in those days, who gave themselves Greek names, such are Melanchthon, Bucer, Erasmus, &c.

METHODISTS. This term has been applied both to Papists and Protestants: in the seventeenth century polemics arose in France and elsewhere in opposition to the Huguenots; these, from their manner of defending Popery, were termed Methodists. At the present time however, by the *Methodists* is understood the sect founded by Mr. JOHN WESLEY, in conjunction with a Mr. Morgan; Mr. Charles Wesley, (brother of John,) and others afterwards united with them; and in 1735 they were joined by Mr. Whitfield; between which period and 1741, Wesley and Whitfield mutually laboured in different parts of the kingdom, in Scotland, Ireland, and America, to extend and establish the cause of *Methodism;* but in March of the last named year, there was an entire separation between them; Wesley not holding the same tenets which Whitfield and his followers strenuously supported. So that, ever since, there have been two sorts of Methodists, the *Wesleyans*, who hold general redemption, and the *Whitfieldites* who consider such errors dangerous, and preach only particular redemption: Whitfield's principles approach *Calvinism*, Wesley's *Arminianism*, which see.

MILLENARIANS are those who believe that Christ will reign personally on earth for a thousand years. The name, taken from the Latin *mille*, "a thousand," and *annus*, "a year," has a direct allusion to this spiritual empire. The doctrine of a millenium is, it is said, a Jewish tradition, and announces the approach of a sabbath of a thousand years, to be ushered in by the glorious advent of the Messiah. It was, however, adopted by the author of the Revelations, and subsequently by many Fathers of the church. There is something sublime and animating in it; and, hence, there are still those who entertain an expectation of a millenium.

MORAVIANS, the followers of Count ZINZENDORF, a German nobleman, who died in 1760; they are called Moravians because the first converts were some *Moravian* families; they were also called *Hernhuters* from Hernhüth, the name of the village where they first

settled. The society themselves, however, assert that they are descended from the old Moravian and Bohemian brethren who existed as a sect sixty years prior to the Reformation. They style themselves *Unitas Fratrum*, or United Brethren, and, in general, profess the *Augsburgh* confession of faith.

When the first reformers assembled at Augsburgh, in Germany, the Protestant princes employed Melanchthon, a divine of great learning and moderation, to draw up a confession of their faith, expressed in terms as little offensive to the Roman Catholics as a regard for truth would permit; this creed is called the *Confession of Augsburgh.*

MUGGLETONIANS, the followers of *Muggleton* a journeyman tailor, who, and his companion Reeves, of equal obscurity, set up for great prophets in the turbulent times of Cromwell.

MYSTICS, those who profess a pure and sublime devotion, with a disinterested love of God, free from selfish considerations; passive contemplation is the state to which they aspire. Of this sect there have been many singular characters, especially Madam Guyon, a French lady who made a great noise in the religious world. Fenelon favoured this devotee's sentiments, for which he was persecuted by Louis XIV. and reprimanded by the Pope. The Mystics suppose that certain passages of scripture have three mystical senses.

NECESSITY regards the origin of human actions and the specific mode of the divine government. Much controversy has taken place on this subject; Edwards, Priestley, Hartley, Price, Crombie, &c. are distinguished in it. See WILL, page 20, and FREE-WILL above.

The PAPISTS or ROMAN CATHOLICS, those who follow the tenets of the Church of Rome, of which the POPE is the head. The infallibility and supremacy of the Pope has been generally stated as the leading tenets of this sect; but, whatever might be formerly the fact, it is at present very questionable; certain however it is that Roman Catholics do nevertheless consider the pope as the head of their church. Among other tenets they believe in what is called transubstantiation; they also worship the Virgin Mary, the cross, and innumerable saints and images.

The laws relating to Roman Catholics which prohibited them from sitting in either house of parliament, &c. were repealed in April, 1829; and it is hoped that such liberal conduct on the part of Protestants will be met with equal kindness and generosity on the part of those who have been so long shut out from such important civil privileges.

PREDESTINATION is said, by controversialists, to be the decree of God, by which he is supposed to have, from all eternity, unchangeably appointed whatsoever comes to pass; and hath more especially fore-ordained certain individuals of the human race to everlasting happiness, and hath passed by the rest, and fore-ordained them to everlasting misery. The former of these are called the *elect*, and the latter the *reprobate*. Shocking as this doctrine is, it is to be lamented that a very large body of persons entertain it: we fear it is very much calculated to make men unfeeling and unkind towards their fellow creatures; not to say that it appears to impeach the benevolence even of Deity itself.* See BELIEF below.

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* That God has determined not to save those, who neglect to repent and believe on the Saviour, is a truth acknowledged by all who correctly understand the scriptures. It is doubtful whether there now is,

PRESBYTERIANS. The members of the Kirk of Scotland are, strictly speaking, the only Presbyterians in Great Britain. The term is derived from πρεσβυτερος, "*senior*," or "elder." Their mode of ecclesiastical government was brought from Geneva by John Knox the Scotch reformer. The Presbyterians maintain, that the church should be governed by Presbyteries, synods, and general assemblies; in Scotland are fifteen synods, and sixty-nine presbyteries. Their doctrine is Calvinistic; and their general assembly is held annually in the month of May, at Edinburgh.

In England, the term presbyterian is applied to a large and respectable class of dissenters, who have no attachment to the Scotch mode of church government; and, therefore, to this body of Christians, the term Presbyterian, in its original sense, is very improperly applied. English Presbyterians adopt the same mode of church government as the independents: the only difference between those and the independents is, that these last are less attached to Calvinism, and consequently admit a greater latitude of religious sentiment.

PROTESTANTS include all Christians who dissent from popery, in whatever country they reside, or into whatever sects they have been distributed, except the *Greek Church*. Abroad, they are divided into ***Lutherans***, who adhere to the tenets of Luther; and the ***Reformed***, who follow the discipline of Geneva. They were called Protestants, because they *protested* against a decree of the Emperor Charles V., and declared that they appealed to a general council. At present, this vast class comprehends those differing from the established religion in France; the *refugees* in Holland, who fled thither and elsewhere subsequent to the revocation of the edict of Nantz in 1685; the Presbyterians in Scotland; the Episcopalians and numerous dissenters from the church establishment in England; together with a vast body of different sects in America and other parts of the world.

PURITANS, a term much used in this country in the seventeenth century; it was applied chiefly, if not entirely, to the Calvinists, from their professing to follow the pure word of God, in opposition to all traditions, human construction, and other authorities.

The QUAKERS, or as they call themselves FRIENDS, originated in England about 1650. George Fox is generally considered as their founder; he was imprisoned at Nottingham, for having publicly

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or ever has been a sect, which maintains, that God independently of a just regard to the conduct of his creatures, appoints, or fore-ordains them to eternal misery. If a few solitary expressions seem to imply such an opinion, these expressions are commonly so qualified by other statements as clearly to guard the reader against it. It is not the doctrine of predestination as maintained by any Christian sect, but the misunderstanding, or the misrepresentation of it by their enemies, that renders it "shocking" to the sensibilities. It is a perversion of it, that "makes men unfeeling and unkind towards their fellow creatures," and leads them "to impeach the benevolence even of Deity itself." No class of men are found to be more kind to the members of the human family, more ready to mitigate suffering, more inclined to promote the happiness of society, or more full of elevated and adoring conceptions of the Deity; than they, who hold precisely those views of predestination which are unfolded in the Scriptures. See Belief below and note.

opposed a preacher. The year following he was brought before two justices in Derbyshire: one of them scoffing at him for having bidden him, and those about him, tremble at the word of the Lord, occasioned the imputation of *Quaker*. It is difficult to give a specific statement of their tenets; but they may be found in a well written apology by Robert Barclay, a learned Quaker, who died in Scotland in 1690. The chief things besides doctrines, by which the Friends are distinguished are, that they have no established or acknowledged priesthood, nor is any one paid for officiating in their places of worship; thus proving that a religion may be supported without clergy; and a peculiarity in the dress of both male and female, which distinguishes them from every other sect. The Friends are distinguished by plain yet benevolent manners; their forbearance and firmness on a variety of occasions deserve imitation. It should be added, that they reject water baptism and the Lord's supper; are firm advocates for Arminian doctrines; and never voluntarily pay tithes. Their own poor are supported without parochial aid. They reprobate war, the traffic in slaves, and abhor religious persecution. Their affirmation instead of an oath, is now permitted in both civil and criminal cases. There are seven yearly meetings among them; one in London and the others in America. CLARKSON'S PORTRAITURE of this sect is well worthy perusal.

SABBATARIANS, a body of Christians who keep the *seventh* day as the sabbath, and are found principally, if not wholly, among the Baptists. The Sabbatarians think the reasons assigned by other Christians for keeping Sunday instead of Saturday, the seventh day, unsatisfactory.

The SABELLIAN reduces the three persons in the Trinity to three characters or relations. This notion originated with *Sabellius* in the third century. Dr. Watts towards the close of his life became a Sabellian, and wrote several pieces in defence of the doctrine.

SECEDERS; those who dissent from the Kirk of Scotland so call themselves. The Seceders are rigid Calvinists, austere in their manners, and severe in their discipline; they are divided into *burghers* and *antiburghers*. They originated under Ralph and Ebenezer Erskine in 1730. There is also a kind of dissenters in Scotland called *Relief*.

The SHAKERS arose about the year 1774, when they emigrated to America under their spiritual mother *Ann Lee*, a niece of General Lee. Their place of residence is called New Lebanon, in the state of Ohio. Their property is all in common: and the utmost neatness is conspicuous in their fields and gardens. They reject marriage. Their worship, in which *shaking*, dancing, &c. predominate, whence their name, is, however, less extravagant than it once was. The whole number in this religious community, was said to be, in 1820, fifteen hundred. In discipline and dress they approach the Quakers; but they are nevertheless generally considered a preposterous sect, a contemplation of which, and we may add of many other sects noticed in this sketch, must convince the unprejudiced that *reason* ought not to be given up in matters of religion.

SOCINIANS, those who follow the doctrines of LELIUS SOCINUS, who was born at Sienna in 1525. To him succeeded *Faustus Socinus*, his nephew; they both taught the same doctrines. The Socinian maintains that Christ had no existence till born of the Virgin Mary; and that being a man like ourselves, though endowed with a large

portion of Divine wisdom, the only objects of his mission were to teach the efficacy of repentance without an atonement; to exhibit an example of imitation; to seal his doctrine with his blood; and in his resurrection to indicate the certainty of our own. Modern and ancient Socinians differ: the miraculous conception and the worship of Christ, allowed by Socinus, are rejected by modern Socinians. This sect is sometimes called HUMANITARIANS, from maintaining the simple humanity of Christ. They have latterly, however, assumed the name of UNITARIAN, which see.

SWEDENBORGIANS, the followers of Emanuel Swedenborg, a Swedish nobleman, who died in London in 1772; but which he chose to name the *New Jerusalem Church*, alluding to the church so called in the Revelations. His tenets, although peculiarly distinct from every other sect in Christendom, are nevertheless professedly drawn from Scripture. It is in every sense of the word a visionary religion: not only are the Scriptures themselves considered, in what the Baron is pleased to call *correspondences*, he contending that they contain three distinct senses, *Celestial*, *Spiritual*, and *Natural;* but he also maintains that he had frequent intercourse with spirits and angels! His works are written in the Latin language; and had they not been thus mixed up with learning, it is not very difficult to divine what their reception would have been. As it is, we are only surprised that such a sect could ever have obtained any intelligent followers; yet it must be admitted there are many such in England, Sweden, Germany, and America. They use a liturgy, and instrumental as well as vocal music in their public worship.

The TRINITARIAN believes the doctrine of a Trinity; by which is generally understood three distinct persons in the Godhead, the Father, Son, and Holy Ghost. The word *Trinity* is not to be found in the Bible, but is a scholastic term from *Trinitas*, Lat., denoting a threefold unity.

UNITARIANS, an intelligent, respectable, and increasing body of sectaries, who, without losing sight of Christianity, reject what is found in other creeds that appears, in their estimation, repugnant to reason and common sense. They approach in many respects to the Arian and Socinian, yet in others they differ from both.* See ARIAN and SOCINIANS.

UNIVERSALISTS, those who believe that as Christ died for all, so, before he shall have delivered up his mediatorial kingdom to the Father, all shall be brought to a participation in the benefits of his death by their restoration to holiness and happiness. Their design seems to be to reconcile the tenets of Calvinism and Arminianism by uniting the leading doctrines of both as found in the scriptures; from which union they think universal restoration naturally flows. In

* The author might have informed his readers that the word *Unitarian* "is not to be found in the bible." It is also a scholastic term, frequently used as the common name of all, who deny the *Supreme Divinity of our Lord Jesus Christ*, whether they be *Arians*, *Ancient Socinians*, *or Modern Humanitarians*. These classes of Unitarians differ widely from one another. The propriety of denominating them "intelligent," "respectable," or "increasing" in distinction from other sects, is fairly questionable.

short, according to the universalists, every one, whether sinner or saint, will, sooner or later, enter into everlasting happiness.

Many other Christian sects, such as the *Athanasians*, the *Materialists*, the *Free Thinking Christians*, *Sub* and *Superlapsarians*, *Jumpers*, *Sandemonians* &c. &c. might be mentioned; those, however, who desire information concerning them may consult Dr. Evans's "*Sketch*."

In concluding this notice of religious sectaries, it may be appropriate here to notice a term of frequent occurrence in religious controversy:

BELIEF, a term not, we fear, usually understood with that accuracy which the importance of the subjects, concerning which it is most frequently used, seems to demand. The word belief, in common discourse, has many shades of meaning. Dr. Johnson gives six different ones to it. His first is "*Credit given to something which we do not ourselves know*—Faith—Religion—Persuasion—the thing believed—Creed." Now we think the first definition will be found essentially to include all the rest; and if so, belief, of whatever kind, is always something different from certainty: for example; the best of all evidence is the evidence of the senses; if we do not see, or know by any of the other senses, a thing, it may, nevertheless, exist; and we may *believe* in its existence, being told of it by a credible witness; but this, after all is no more than a *high probability*. Apply this reasoning to religious subjects, and we shall find that the strongest belief on any given point can never be more than the highest probability. This consideration ought to teach us extreme diffidence and humility in regard to our own opinions, and most of all of religious opinions. If belief could be reduced to certainty, it would be impossible that such a variety of religious opinions, found in the world, could long exist. We may add, universal charity and benevolence are the best antidotes for differences of belief on the many great and important subjects that have long engaged, and, no doubt, will continue to engage the attention of mankind.*

* The doctrine, here laid down, seems to be that the evidence of the existence of any thing, which we have not perceived by our senses, *is no more than a high probability*. I have never *seen* France, England, or Russia. I have been *told of them by credible witnesses*. With the evidence which I possess of their existence, would it not be absurd for me to say, I do not *know*, that there are such countries as France England and Russia, but *I think it highly probable?* Is not every rational and well informed man as fully convinced of their existence, as he would be, had he visited them every year of his life? His conception of these countries may not be as distinct but his knowledge of their existence is as certain as if his own eyes had beheld them. And on leaving the shores of his native land to go to either of these nations, his mind would never cherish a doubt, lest all that he had heard of them should prove to be a misrepresentation.

The same thing is true of the Great Outlines of Christian Truth and Duty. It is derogatory to Jehovah to suppose, that in making a Revelation of his own character and our duty he has communicated his instructions in a manner so obscure, that they cannot be understood by man. This is a point conceded by all liberal minds. Now if God has taught us things, which lie beyond the circle of our senses, and if we are capable of understanding what he has taught,

Religion and Religious Distinctions out of the Pale of Christianity.

PAGANISM, the religious worship and discipline of Pagans; generally considered as being the adoration of idols and false gods. The origin of the term pagan has been disputed; it is, probably derived from *paganus*, Lat. *in or of the country;* and hence, as country persons were formerly much more ignorant and rude than citizens, the name has been since applied to those who were unacquainted with the Christian religion—ignorant and rude of course. Paganism, in its most extensive signification, implies every religion, wherever professed, not included in Christianity or Judaism. But paganism is, nevertheless, a very vague term. It will be impossible for us to notice the numerous subdivisions into which the pagan world was formerly or now is divided; we can only give a brief sketch of those which are the most important. See page 375.

MOHAMMEDANISM, called also Islam or Islamism, is the religion of Mohammed or Mahomet, who was born in 571 at Mecca, a city of Arabia, and died at Medina in 631. His system is a compound of Paganism, Judaism, and Christianity. Most of the inhabitants of Turkey in Europe and Asia, of Persia and Arabia, of Egypt and the greater part of the inhabitants of Africa profess the Mohammedan religion; to these may be added many detached portions of the same superstition in India, Malacca, &c. See Hegira forwards.

The ALCORAN, or *the* Koran, *al* being the definite article in Arabic, is the Scripture or Bible of the Mohammedans, and is held in great reverence, though it is replete with absurd representations. It is divided into 114 chapters; and each chapter into smaller portions or verses, called by the Arabic word, *ayat*, signifying *signs* or *wonders.* There are other divisions for particular uses. The Koran is universally allowed to be written with the utmost elegance and purity of language, in the dialect of the tribe of Koreish, the most noble and polite of all the Arabians. The general design of the Koran was to unite the professors of the three different religions then followed in Arabia, the greater number being idolaters, the rest Jews and Christians.

CALIPH denotes a successor of Mohammed; the word being Arabic, Khalifah, implying a successor, vicar, or heir. After the death of Mohammed, Abubeker having been elected to supply his place, he would take no other title but Khalifah, or vicar of the prophet or messenger of God. Vattier observes, that the sultans and kings fell down before them, and kissed their feet.

MUSSULMAN, or Muslyman, a title by which the Mohammedans distinguish themselves, implying, in the Turkish language, true believers or orthodox. In Arabic the word is written Moslem, Mosleman, or Mossolman. It was first applied to the Saracens.

MUFTI, or Muphti, the chief of the ecclesiastical order, or pri-

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then there is no real obstacle to prevent our *belief from rising into absolute certainty*, and being (in the expressive language of the Scriptures) "THE SUBSTANCE OF THINGS HOPED FOR." The remedy then, for difference of belief on any important branch of religion is a *thorough, a prayerful, and a docile study of the Scriptures.*

mate of the Mussulman religion. The authority of the Mufti is very great in the Ottoman empire: it is said even the sultan himself, if he would preserve any appearance of religion, cannot, without hearing his opinion, put any person to death, nor even inflict corporal punishment. He is, however, appointed by the Grand Seignior; if convicted of treason or any greater crime, he is put into a mortar, kept for the purpose in the Seven Towers at Constantinople, and pounded to death.

DERVIS, or DERVISH, a name given to a sort of monks (or Mohammedan religious order) who lead a very austere life, and profess extreme poverty. They are allowed to marry. The word is originally Persian, and signifies a beggar. Their chief monastery is that near Cogni, in Natolia, which the general makes his residence, and where all the assemblies of the order are held; the other houses being all dependent on this, by a privilege granted to this monastery under Ottoman I. The Dervises affect great modesty, patience, humility, and charity. There are also Dervises in Persia, called, in that country, *Abdals*, q. d. servants of God. They lead a very penurious austere life, and preach the Koran in the streets, public-houses, and wherever they meet with auditors. These Persian Dervises retail little else but fables to the people, and are held in the greatest contempt among the men of wit and letters.

HINDOOS, HINDUS, or GENTOOS, the inhabitants of India or Hindoostan, who profess the religion of the Bramins, supposed to be the same with that of the ancient Gymnosophists of Ethiopia. They are divided into four *castes* or tribes, namely, the *Bramins* or priests; the *Cshatriyas* or soldiers; the *Vaisyas* or husbandmen; and the *Sudras* or labourers. All these have distinct offices, and cannot, according to their laws, intermingle with each other; for certain offences they are subject to the loss of their caste, which is reckoned the highest punishment they can suffer; and hence is formed a sort of fifth caste, named *Pariahs;* but in *Sanscrit* or the sacred language, they are called *Chandalas;* these are considered the dregs of the people, and employed only in the meanest offices.

The religion of the Hindoos is contained in *four* books named *Veda* or *Bedas*, written in the *Sanscrit*, and now known only to the learned among them. Besides these there are other books that treat of divinity. Such are the *Sastras* or *Shasters;* and others called *Upavedas*, which are commentaries on the Vedas. Among the Hindoos are two kinds of worship—that of the invisible God, *Brahm*, and of idols. Notwithstanding the numerous absurdities in this religion, it is unquestionably one of benevolence towards animals; but the ceremony of burning widows alive at the funeral pile of their husbands, the sacrifices at the idols of Juggernauth, and the desertion of the sick, aged, and infirm of their own species, are horrible, cruel, and disgusting.

BRAMINS, the priests among the Hindoos. They are found in Siam, Malabar, China, Coromandel, and many other Eastern nations, but their chief seat is in Hindoostan. They have a language peculiar to themselves, which they call *Sanscrit*, in which they have several ancient books. There are several orders of Bramins. Those who mix in society are, for the most part, corrupt in their morals, and live without either restraint or virtue; believing that the *water* of the Ganges will wash away all their crimes. And the others who live

abstracted from the world, abandon themselves to laziness, superstition, and the dreams of metaphysics.

PUNDITS or PENDITS, are learned Bramins devoted to the study of the Sanscrit language and to the ancient science, laws, and religion of Hindoostan.

BRACHMINS, BRACHMANS, or BRAHMANS, ancient philosophers of India, remarkable for the austerity of their lives and manners. Some say they derive their name from the patriarch Abraham, whom they call in their language Brachma. There are other derivations equally plausible. The Greeks, who called them Gymnosophists, ascribed to them the doctrine of the immortality of the soul, and certain notions concerning the nature of a Supreme Being, and future rewards and punishments. Some remains still appear of these ancient Brachmans under the denomination of Bramins. (See above.)

BUDDHISTS, the professors of BUDDHISM, a branch of the Hindoo religion pervading Ceylon, the Birman empire, and China; but it differs in many particulars from the last named faith. All admit that *Buddha* was the ninth *Avatar* or incarnation of the Hindoo deity in the character of Preserver, who reformed the doctrines of the Vedas, and severely censured the killing of any animal. The Braminical divinities animate and direct all things; those of the Buddhists do not interfere in human affairs; but the Buddhists believe that men of superior sanctity in life have the control of human affairs after death; they are, therefore, the sole objects of their worship.

It should be mentioned, that although this sect pervades China as well as some other superstitions, and the philosophy of Confucius, religion has scarcely any external form in that country, there being neither sabbatical institutions, national priesthood, congregational worship, nor any devotional petition or thanksgiving to the Supreme Being ;—the emperor is considered as the high priest, and he alone performs the outward duties of religion according to an ancient ritual at certain periods ; but in these services the people seem to take no part.

DRUIDS, DRUIDES, DRUIDÆ ; the priests or ministers of religion among the ancient Celtæ, or Gauls, Britons, and Germans. Some authors derive the word from the Hebrew, *Derussim*, or *Drussim*, which they translate "contemplators." Pliny derives the name from the Greek, *δρυς*, *drus*, signifying *oak*, on account of their inhabiting, or at least frequenting, and teaching in forests ; or, perhaps, because they sacrificed under the oak. It can scarcely be supposed that the Druids spoke Greek; but *deru* is the Welsh, or ancient British, name for an oak. The Druids were the first and most distinguished order among the Gauls and Britons; they were chosen out of the best families: and the honours of their birth, joined with those of their function, procured them the highest veneration among the people. They were versed in astrology, geometry, natural philosophy, politics, and geography ; and had the administration of all sacred things ; were the interpreters of religion, and the judges of all affairs indifferently. Whoever refused obedience to them was declared impious and accursed. Strabo distinguishes three kinds, *Bardi*, *Vates*, and *Druids*. The *bardi* were the poets ; the *vates* were the priests and naturalists; and the *druids*, beside the study of nature, applied themselves likewise to morality.

ZOROASTER or ZERDHUSHT, a celebrated ancient philosopher,

said to have been the reformer or the founder of the magi. It is wholly uncertain, however, to how many eminent men the name of Zoroaster belonged. Some maintain that there was but one Zoroaster, and that he was a Persian; others contend that there were six: Ham, the son of Noah, Moses, Osiris, Mithras, and others, have been named as the same with Zoroaster. Aristotle and Pliny fix the time in which he flourished at 6000 years before the death of Plato. The most probable account of a Zoroaster is, that he lived at a very remote period, and taught the Babylonians astronomy. All the writings attributed to Zoroaster are generally deemed spurious. It is said, however, that the *Parsees*, now found on the West coast of the Peninsula of India, are the followers of Zoroaster.

Number of Persons professing different Religions in the World.

Assuming the population of the globe to be 1,000,000,000, the following estimate has been made, although nothing approaching to certainty can be at present obtained.

Jews	2,500,000
Christians	200,000,000
Mohammedans	140,000,000
Idolaters, those who profess neither the Jewish, Christian, nor Mohammedan worship	657,500,000
	1,000,000,000

There can be no doubt, however, that the number of Christians, or those at least professing Christianity, are constantly on the increase; and that the useful knowledge which they diffuse among the different nations of the earth must lead to beneficial results,—tend to make men generally more intelligent, tolerant, and humane.

Ancient People and Countries.

Scandinavia included the countries now called Sweden and Norway. The Cimbri inhabited the peninsula of Jutland, a part of Denmark. The Huns resided in Hungary; the Pannonians in the eastern part of the same country. The fierce and warlike Goths inhabited Sweden. The Vandals resided in what is now denominated Poland. The Picts resided in Scotland and the northern parts of England; they were so called because they painted their bodies. The ancient inhabitants of Portugal were called Lusitani. The Burgundi were a people of Germany; the Franks were also from another part of that country, and afterwards settled in France. The Celtæ and Iberians were ancient inhabitants of Spain. The Gauls inhabited France and the adjacent parts; they originated from the Celtæ. The Helvetii were in Switzerland. The warlike Belgæ resided in the country now occupied by the Flemings and the Dutch. The Amazons were females who, it is supposed, inhabited the borders of Cappadocia in a part of Scythia; they defended their country from their enemies, and afterwards made war on other parts, but were entirely subdued by Alexander the Great.

GIANTS. Notwithstanding all that has been stated in ancient writers concerning persons of enormous stature, what appears cer-

tain concerning them is, that many individuals have occasionally existed, who have measured more than eight feet in height; but these are unquestionally extraordinary beings. The emperor Maximinus is said to have been of this size; so also was a man exhibited at Rouen in 1735; and in our own times several men upwards of seven feet high have appeared. But that any men have existed of the height of thirty feet, as some romancers have pretended, is beyond the bounds of any probability.

Division of Time.—The Calendar.—Years.—Months.—Days.—Weights and Measures.

The DIVISIONS OF TIME, as they are represented in the Calendar, are composed of days, weeks, months, and years. The way in which these divisions have been determined by the ancients, is very various, and it is also still various in the modern world. The Jews begin the day now, as formerly, at a certain hour of the evening, and finish it on the next evening at the same hour. Their sabbath therefore begins in the afternoon of Friday, and ends in the afternoon of Saturday. The festivals of the Romish Church also begin in the evening; and in some of our own popular observances they begin at the same time. The *civil day*, however, now commences at twelve o'clock at night, and lasts till the same hour of the next night. The *astronomical* day begins at noon, and terminates at the noon of the next day. This mode of reckoning is used in the Nautical Almanac. In France, and most of the states of Europe, the civil day is counted as with us; but in parts of Italy and Germany, the day begins at sun-set, and ends at the same time on the day following.

The CALENDAR is a table of the days of the year arranged so as to indicate the distribution of time, and remarkable days connected with devotion or business. The Romans called the first days of each month *calends*, (from Καλεω, Greek, "to call or proclaim") because the pontiffs on those days *called* the people together, to apprise them of the days of festival in that month. The Roman calendar, said to have been introduced by Romulus, has, in great part, been adopted by almost all intelligent nations.

The YEAR or Solar Year, is the period of time in which the sun passes through the twelve signs of the Zodiac: namely, 365 days, 5 hours, 48 minutes, 51 seconds, and 6 decimals; this is also called the astronomical year.

The Style.

The division of time introduced by Romulus has, however, undergone considerable changes; the first of which was that introduced by *Julius Cæsar*, who, consulting the astronomers of his time, fixed the solar year as 365 days and 6 hours; these hours forming at the end of four years, a day, so that the fourth year consisted of 366 days; the day thus added was called the *Bissextile;* this almost perfect arrangement was called the *Julian style*, and prevailed generally throughout the Christian world, till the time of Pope Gregory XIII., when it was found that the difference between the real and apparent year (being eleven minutes) having amounted to ten entire days,

Gregory ordained, in 1582, that the 15th of October should be counted instead of the 5th for the future; and to prevent the recurrence of the error it was further ordered, that the year beginning a century should not be bissextile, with the exception of that beginning each fourth century. Thus 1700 and 1800 have not been bissextile, nor will 1900 be so; but the year 2000 will be bissextile. The year of the calendar is thus made as nearly as possible to correspond with the true solar year. This change is called the *Gregorian* or NEW STYLE, as that established by *Julius Cæsar* is called the OLD STYLE.

At the Diet of Ratisbon in 1700, it was decreed by the body of Protestants of the empire, that eleven days should be retrenched from the *old style*, to accommodate it to the *new;* this regulation afterwards passed into Sweden and Denmark; but was not adopted in England till 1752, when it was enacted that the year should commence on the first of January instead, as before, on the 25th of March; and that, in that year, the day following the 2d of September should be accounted the 14th, thus omitting eleven days; the omission of one day in every hundreth year, except the four hundredth, was also at the same time enacted.

The Russians still retain the *old style*, which creates much inconvenience in their intercourse with other nations.

The COMMENCEMENT of the YEAR, as stated above, is in this and most other European countries now the 1st of January; but considerable variations prevailed among the ancients, and still partially prevail among the moderns. The *Jews* dated the beginning of the *sacred year* in March; the *Athenians* in June; the *Macedonians* September 24th; the *Christians of Egypt* and *Ethiopia* on August 29th and 30th; the *Persians* on 11th of August. The *Jew's civil year* begins the first day of the month *Tisri*, which, in 1828, corresponded with our 9th of September. The *Mohammedan* year begins on the 1st of the month *Moharem*, which in 1828 corresponded with our 14th of July. Till 1752, even in England, the year did not legally commence till March 25th. In Scotland, at that period, the year began on the first of January. This difference was very inconvenient; and the months January, February, and part of March, sometimes bore two dates, as we often find in old records, as 1711-12. This practice has produced chronological mistakes.

ALMANAC. After what has been said concerning the *Calendar*, the *Almanac* requires little notice, both being essentially the same thing. Respecting the origin of the term *almanac* authors are not agreed; some asserting it to be an Arabian, some a Saxon term. Verstegan writes it *al-monat*, and observes that our Saxon ancestors used to carve the courses of the moon for the whole year upon a square stick or block of wood, which they called *al-monaught*, that is, *al-moon-heed.* An almanac of this kind is described by Dr. Plot. The present plan of almanacs is ascribed to John Muller, who published, at Nuremburg, his New Calendar and Ephemerides, in 1472. Almanacs, in this country, have too long ministered to credulity and ignorance: the *British Almanac*, lately published under the superintendence of the Society for the Diffusion of Useful Knowledge, and the *Englishman's Almanac*, published by the Stationers' Company, may be, however, confidently recommended, and will, we doubt not, lead the way to a better order of such publications.

ÆRA or ERA in chronology is essentially the same as EPOCH;

yet, in the use of these two words, occasional shades of difference are found. The origin of the word era is contested, although it is, probably, from the Arabic, for "time appointed." Some have imagined that it is formed from A. ER. A., abbreviations of the words *annus Augusti erat*, or from the initials of the word *annus erat regni Augusti*, because the Spaniards began their computation from the time that their country came under the dominion of Augustus. It means, however, a fixed point of time from which to begin a computation of the years ensuing. In this sense the term epoch is also generally used. But era also implies a long course of time, including some predominating events. Thus, we say the Christian era began at the birth of Christ.

The ROMAN ERA began from the date of the foundation of the city of Rome, about 752 years before Christ; it is designated by the initials A. U. C., or *Anno urbis conditæ*.

The computation of time from the Birth of Christ, or the CHRISTIAN EPOCH, it is generally allowed, was not introduced till the sixth century, in the reign of Justinian, and is commonly ascribed to Dionysius Exiguus, before which the Christians computed their years in various ways, according to the method of the people among whom they lived. This variety caused great distraction between the churches of the east and west.

The *Epoch with the Jews* is from the beginning of the world; the *Mohammedans* from the HEGIRA, (see below;) of the ancient *Greeks*, from the commencement of the OLYMPIADS, (see below;) of the *Persians*, from *Nabonassar*.

JULIAN YEAR, see above.

JULIAN PERIOD, a cycle of 7980 consecutive years, suggested by *Joseph Scaliger*, who died at Leyden in 1609. Why it is called the *Julian* period has not been satisfactorily explained. It is formed by multiplying together the three following cycles: that of the *sun* twenty-eight years, of the *moon* nineteen years; and that of the *indiction* fifteen years, so that this epoch, although feigned, is of much use: for every year within the period is distinguished by a certain peculiar character; the year of the sun, the moon, and the indiction, will not be the same again till the whole 7980 years have elapsed. Scaliger fixed the beginning of this period 764 years before the creation, or rather the period naturally begins in that year, taking the numbers of the three given cycles as he formed them. Hence the first revolution of the Julian period will be completed in the year of Christ 3267; after which a new revolution of this period will commence.

Correspondence of Ancient Eras with the Vulgar Era, &c.

The year of the Julian period	6542
From the first Olympiad	2604
From the foundation of Rome according to Varro .	2581
From the epoch of Nabonassar . . .	2577
From the birth of Christ	1829

The 5589th year of the Jews began on the 9th of Sept. 1828, and ends on the 27th of Sept. 1829.

The 1244th year of the Turks began on July 14, 1828, and ends on July 2, 1829.

It should be also stated, that from the years 1792 to 1805, the

Gregorian Calendar was abolished in France, new names were given to the months, and the days were arranged in tens, called *decads*, instead of weeks, but at the conclusion of the last-named year, the Gregorian computation was restored.

LEAP YEAR, or BISSEXTILE, contains, in the reformed calendar, 366 days, one day being added to the month of February every fourth year, to include the five hours and about forty-nine minutes by which the solar periods exceed the common year. The deficiency of eleven minutes in the quarter of a day renders the occasional omission of a leap year necessary, as mentioned above in the article STYLE.

QUARTER DAYS. The usual quarter days in this country for payment of rent, &c. are the 25th of March, or *Lady Day*; the 24th of June, or *Midsummer Day*; the 29th of September, or *Michaelmas Day*; and the 25th of December, or *Christmas Day*. February the 2d, or *Candlemas Day*; May the 3d, sometimes called *Holy Rood Day*; August the 1st, or *Lammas Day*; and November the 1st, or *All Saints Day*, are still, though rarely considered as quarter days in some districts of the kingdom, in letting lands. The last days named are sometimes called *Cross Quarter Days*.

CYCLE, a perpetual circulation of the same parts of time. The CYCLE of the MOON is a period of nineteen solar years, equivalent to nineteen lunar years and seven intercalary months: at the end of every nineteen years, the new and full moons happen at very nearly the same times of the year. The ancients discovered this, and reckoned the cycle of the moon so, that it terminated the year before the Christian era. This cycle was marked with letters of gold, thence called the GOLDEN NUMBER, to find which, add one to the date of the year, say 1829, will make 1830, which, divided by nineteen, will produce ninety-six cycles, and there remain six, the *Golden Number* for 1829, which shows that the moon is in the *sixth* year of the lunar cycle. It should be however observed, that this cycle of the moon only holds true for 312 years: for though the new moons return to the same day after nineteen years, yet not to the same time of the day, but nearly an hour and a half sooner; which error in 312 years amounts to an entire day. Yet those who were employed in reforming the calendar, went on the supposition that the cycles returned precisely the same for ever. The use of this cycle in the ancient calendar was to shew the time of the new moon and of Easter for each year; in the new one it only serves to find the epacts. See EPACT below.

The CYCLE of the SUN is the number of years that elapse before the Sundays throughout the year happen on the same days of the month. If there were only 364 days in the year, that would occur every year; if 365, it would occur every seventh year; but as a quarter of a day makes an alteration of a day every fourth year, the cycle must extend to twenty-eight years. The beginning of this cycle, both Julian and Gregorian, is nine years before Christ. *To find the cycle of the sun for any given year*, add nine to the date of the year, and divide the sum by twenty-eight, the remainder will be the number of the years of the present cycle, and the quotient the number of revolutions since Christ. If there be no remainder, it will be the twenty-eighth or last year of the cycle.

EPACT, from the Greek επαγω, "to intercalate" or "add," is the

excess of the solar month above the lunar synodical month, or the solar year above the lunar year. In more common language, the moon's age for the first day of January, or the *equation* between the beginning of the solar and lunar year. The time from one new moon to another is about twenty-nine days and a half. There are, therefore, twelve revolutions of the moon, and eleven days over; the twelfth new moon will take place eleven days earlier each year than it did the year before. In the lunar cycle of nineteen years, there are twelve new moons in each twelve, and thirteen in each seven; because the eleven days of yearly difference in three years exceed a lunar month by three days and a half. If it were not for the odd minutes and seconds, the age of the moon on the 1st of January could always be found by multiplying the golden number by eleven, and dividing by thirty, then the remainder would be the epact or age of the moon on the 1st of January.

To find the day of the moon's age on the 1*st of January till the end of the present century:* Take one from the golden number, multiply what is left by eleven, and divide by thirty; the remainder will be the epact: thus for 1829 the golden number is six; take away one, leaves five, which, multiplied by eleven, makes fifty-five, which, divided by thirty, leaves twenty-five, the *epact* or moon's age on the 1st of Jan. 1829.

DOMINICAL LETTER; one of the first *seven* letters of the alphabet, used in almanacs, &c. to denote the *Sundays* throughout the year. The word is formed from *Dominica*, or *Dominicus dies*, Lord's Day, Sunday. If the year begin on a Sunday, it is A; if on a Monday G; if on Tuesday F, and so on. Generally to find the dominical letter, call New Year's Day A, the next B, and so on till you come to the first Sunday, and the letter which answers to it is the dominical letter. But in consequence of *bissextile* this subject requires more space to be explained than we can devote to it. These letters were introduced into the calendar by the primitive Christians, instead of the *nundinal letters* (the first *eight* of the alphabet) so called by the Romans, and used in their calendar. One of these letters always expressed their market days, or the assemblies called *nundinæ, quasi novendinæ*, because they returned every nine days: for, the country people, after working eight days successively, came to town on the ninth, to sell their several commodities, and inform themselves of what related to religion and government.

INDICTION, the *Roman*, a cycle of fifteen years, established by the Emperor Constantine for the payments of certain tributes in 312, has no connection with the sun or moon, further than its consisting of fifteen years. To find it for any year subtract 312 from the date of the year, and divide by fifteen, the remainder is the indiction. The term is derived from *indico*, Lat. "to publish or proclaim."

OLYMPIAD, a period of *four years*, by which the Greeks reckoned their time. This mode of computation arose from the *Olympic Games*, which were celebrated at the conclusion of every fourth year, near the city of Olympia in the Peloponnesus. The first Olympiad began, it is said, in the year 3938 of the Julian period; the year from the creation 3174; before Christ 776; and twenty-four or twenty-three years before the building of Rome. The computation by Olympiads ceased after the 364th, which ended with the year of Christ 440; except that, it is said, in a charter of our king Ethelbert,

the years of his reign are reckoned by Olympiads. The Olympiads were also called *Anni Iphiti*, from *Iphitus*, who instituted or renewed the Olympic Games.

CALENDS or CALENDÆ, in the Roman Calendar, the *first* day of every month. The origin of the word is stated under *Calendar* above; it is, however, immediately derived from *calo*, Lat. "to call or convene." It was one of the offices of the *pontifices* to watch the appearance of the new moon, and give notice to the *rex sacrificulus;* upon which a sacrifice being offered, the pontiff summoned the people together in the Capitol, and there, with a loud voice, proclaimed the number of the calends, or the day on which the nones would be, which he did by repeating this formula as often as there were days of calends, *Calo Juno Novella.* The Greeks had no calends, and hence the proverb with the Romans, *ad Græcas Calendas*, "at the Greek Calends," that is, *never.*

NONES, NONÆ, in the Roman calendar, the *fifth* day of the months January, February, April, June, August, September, November, and December, and the 7th of March, May, July, and October. The last four months having six days each before the nones, and the others only four. The origin of the word was probably this: the day of the nones was *nine* days before the Ides, and might be called *Nono Idus.* March, May, July, and October had six days in their nones; these, in the ancient division of the year by Numa, having thirty-one days each, February thirty, and the rest twenty-nine. But when Julius Cæsar reformed the calendar, he made that year to consist of fifteen months, or 445 days; which, for this reason, is usually called *annus confusionis*, or "year of confusion."

IDES, or IDUS, in the Roman calendar, a name given to eight days in each month; in March, May, July, and October, the Ides began on the 15th day, and in the other months on the 13th day of each month, and were reckoned backward, so as, in the four months above specified, to terminate on the 8th day, and in the rest on the 6th. The 15th day of March, May, July, and October, and the 13th in the other months, were called the Ides of these months; *Idus Martii*, *Idus Maii*, &c. The thirteenth day in the four months, and the eleventh in the eight, were called the third of the Ides of such months, 3 *Idus Martii*, &c. So the twelfth day in the four, and the tenth day in the eight months, were the fourth of the Ides, 4 *Idus Martii*, &c. And thus of the rest, to the eighth and sixth days, which made the eighth of the Ides, 8 *Idus Martii*, &c. This way of accounting is still in use in the Roman chancery, and the calendar of the breviary. The Ides of May were consecrated to Mercury; the Ides of March were ever esteemed unhappy, after Cæsar's murder on that day; the time after the Ides of June was reckoned fortunate for those who entered into matrimony; the Ides of August were consecrated to Diana, and observed as a feast day by the slaves; on the Ides of September auguries were taken for appointing the magistrates, who formerly entered into their offices on the Ides of May; afterward, on those of March.

The HEGIRA is the epoch used by Mohammedans, or the period of the flight of Mohammed from Mecca, which happened on the 16th of July 602. The Mohammedans, however, always calculate by the lunar instead of the solar year, and hence it is necessary to

add the epacts to ascertain the corresponding year in the Christian era.

Feasts and other Remarkable Days.—Months.—Days.

NEW YEAR'S DAY is January the first. It is also called the Circumcision, and was instituted by the Church in commemoration of the ceremony, under the Jewish law, to which Christ submitted on the eighth day from his birth; it was introduced into the Church of England Liturgy in 1550.

The EPIPHANY, επιφανια, Gr. signifies *appearance*, and is kept January 6th, to commemorate the manifestation of Christ to the Gentiles by a star. It was first observed in 813; being twelve days after Christmas, it is commonly called *Twelfth Day*.

PLOUGH MONDAY, the first Monday after the Epiphany, formerly so called as being the period when persons engaged in agriculture returned to the use of the plough.

TERMS.—Four seasons of the year in which the courts of justice in London are open for determining suits at law. *Hilary* or *Lent Term* begins on the 23d of January, and lasts till February 12. *Easter Term* begins on the Wednesday fortnight after Easter Day, and ends the first Monday after Ascension Day. *Trinity Term* begins on the Friday after Trinity Sunday, and continues to the Wednesday fortnight from that period*. *Michaelmas Term* begins on Nov. 6, and ends on the 28th of the same month. The *Terms at Oxford* are similar in name to these, but longer. The terms at Cambridge vary from those at Oxford; the Scottish and Irish law terms also vary from those in London; but we cannot describe the differences.

CANDLEMAS or Purification, the 2d of Feb., is held in honour of the Virgin Mary. It is called Candlemas, because the ancient Christians on this day, used an abundance of lights in memory, as it is supposed, of our Saviour's being declared by Simon a light to lighten the Gentiles. The practice of lighting the churches has been discontinued in this country since the reign of Edward VI.

For SEPTUAGESIMA, &c. see forward page 439.

VALENTINE'S DAY is Feb. 14. A *valentine* needs no explanation. The custom of valentines is very ancient, but its origin much controverted. St. Valentine was a presbyter of the Church, who was martyred under Claudius II., at Rome, in 271.

SHROVE TUESDAY depends upon Easter; it, of course, varies with that moveable feast. It is so called from the Saxon word *shrive*, "to confess." Hence *Shrove Tuesday* means confession-Tuesday; on this day, during the Romish times, every body was obliged, one by one, to confess his sins to his own parish priest in the parish church. For which purpose the great bell in every parish was rung; and, it is said, that even now the bell is in some places occasionally rung, and called *the pancake-bell;* perhaps because, after confession

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* A bill has been just brought into Parliament to render all the *law* terms fixed and of the same length—twenty-one days each: namely, *Hilary* to commence Jan. 14th, end Feb. 3d; *Easter*, April 14th, end May 4th; *Trinity*, the 5th, end the 25th of June; *Michaelmas*, the 1st, end 21st of Nov.: but we cannot yet speak of it as *law*.

it was then the custom to dine on pancakes and fritters, as it is at the present time on this day.

LENT, from *lentus*, Lat. a time of mortification and fasting, chiefly among Roman Catholics, during forty days, in commemoration of our Saviour's fasting so long in the desert, and by way of preparing for the feast of Easter. Ercombert, king of Kent, first appointed the fast of Lent in this country in 641.

ASH WEDNESDAY, the first day of Lent, so called, it is said, from a custom in the Romish church of sprinkling ashes on the heads of penitents.

EMBER WEEKS or DAYS, certain seasons for imploring God's blessing by prayer and fasting upon the ordinations performed at such times. Some suppose the word *ember* was taken from *embers*, the *ashes* then strewed on the head. Others derive it from *ymbren*, that is, circular days, corrupted into ember days by the canonists. They were appointed at the four cardinal seasons.

MIDLENT or MOTHERING SUNDAY. The term *mothering* implies the ancient usage of visiting the mother or cathedral church, when voluntary offerings were made, now called Easter offerings.

LADY-DAY, or The ANNUNCIATION, is on March 25. The anniversary of the annunciation to the *Virgin Mary*, called by the Roman Catholics "Our Lady"; hence the term Lady-Day.

PALM SUNDAY, the Sunday next before Easter; so called from the ceremony of bearing palms, in commemoration of Christ's triumphal entry into Jerusalem, when branches of palm were spread before him.

MAUNDAY, or rather MANDATE THURSDAY, the Thursday in Passion-week, so called from the command of our Saviour to his Apostles, to commemorate him in the Lord's supper, which he this day instituted. In this country the Lord Almoner attends in Whitehall Chapel, to distribute food, clothing, and money to the poor on this day; the custom began in the reign of Edward III., and has continued uninterruptedly to the present time.

GOOD-FRIDAY. From the earliest times of Christianity, this day, the Friday before Easter Day, has been held as a solemn fast, to commemorate the crucifixion. The term *good* is said to be peculiar to the Church of England. The Saxons denominated this day Long Friday, from the length of the offices and fastings. The week in which this day fell was, in the primitive church, called Holy Week; with us it is called *Passion Week.*

EASTER or EASTER SUNDAY, a moveable festival held in commemoration of the Resurrection, and being the most ancient and important observance regulates the other moveable feasts of the whole year. The term *Easter* is derived from the goddess *Eostre*, worshipped by the Saxons with peculiar ceremonies in April. The Greeks call it *πασχα*, the Latins *pascha*, a Hebrew word, signifying *passage*, applied Jewish to the feast of the passover.

Easter is directed to be celebrated on the first Sunday after the first full moon that happens next after the 21st of March, the vernal equinox. The limits, therefore, within which it must fall, are the 22d of March and the 25th of April inclusive. The method of *finding Easter* is by reference to the *epact*, &c. but our limits prevent the detail.

It is said that this method of fixing Easter was adopted that the

Christians might avoid its celebration at the same time with the Jewish Passover, which, according to the Mosaic institution, was held on the day of the full moon. The PASSOVER, we may just observe, is a solemn feast of the Jews, to commemorate the destroying angel's passing over the dwellings of the Israelites, when he destroyed all the first born of the Egyptians.

May 3d. Sometimes called, in the Protestant calendar, *Holy-rood-day;* and *the day of the finding* or *invention of the Cross.* A feast celebrated in memory of St. Helena's finding, it is said, the true cross of Christ deep in the ground of Mount Calvary. Holyrood day, in the Romish church, is the 14th of September, a festival called also *the exaltation of the Cross.*

ROGATION SUNDAY, as well as the three days following it called *Rogation days*, are derived from the Latin word *rogare*, "to beseech," because the early Christians used extraordinary prayers and supplications on those days which preceded Holy Thursday. The whole week in which these days happen is called *Rogation week.*

ASCENSION DAY, or HOLY THURSDAY, is the day on which the Church celebrates the ascension of Christ, being the fortieth day after his resurrection.

WHITSUNTIDE, or WHIT SUNDAY, a day of considerable note among Christians, falls some time between the 9th of May and the 14th of June. It is called *White* or *Whit Sunday*, because in the primitive church it was the stated time of baptism, when those newly baptized put on *white* garments as types of purity. On this day is celebrated the descent of the Holy Ghost on the Apostles. As there was a feast of the Jews called *Pentecost*, this name has also been retained for the feast of Whitsuntide among the Christians. It is exactly forty-nine days, or seven weeks, from Easter. The PENTECOST of the Jews is kept in memory of the laws being given by Moses fifty days after the departure of the Israelites from Egypt.

TRINITY SUNDAY, the Sunday next after Whit Sunday: the term *Trinity* was given to it to denote the festival in honour of the Trinity.

MIDSUMMER DAY, June 24th. The *Nativity of St. John the Baptist.*

The DOG DAYS, or CANICULAR DAYS, begin on the 3d of July, and end on the 11th of August. They denote the days in which *Sirius*, the *Dog Star*, rises and sets with the sun; this coincidence has been erroneously regarded as the cause of excessive heat, and consequent calamities. This star, in fact, not only varies in its rising in every one year as the latitude varies, but is always later and later in all latitudes, so that in time, it may be charged with bringing frost and snow!—DR. HUTTON.

LAMMAS DAY, the 1st of August. The origin of the term *Lammas* does not seem with certainty known. The most probable appears to be, that on this day the tenants who formerly held lands of the cathedral church in York, were bound by their tenure to bring a lamb alive into the church at high mass.

MICHAELMAS, or MICHAELMAS DAY, the 29th of September; a festival established in the year 487, in honour of Michael, under the title of *St. Michael and all Angels.*

ALL SAINTS, or ALL HALLOW'S DAY, the 1st of November, in

the Protestant church, a day of general commemoration of all those saints and martyrs in honour of whom individually no day is assigned.

MARTINMAS, or St. Martin's Day, is the 11th of November; it is often corrupted to *Martelmas*, or *Martlemas*.

ADVENT, from *Adventus*, Lat. "a coming," the approach of the feast of the nativity. It includes four Sundays.

CHRISTMAS, a festival of the Church universally observed on the 25th of December, in memory of the nativity of Christ. There seems to be little certainty as to the day or month in which Christ was born; according to Pochon's account it happened on the 16th of May; from Clemens Alexandrinus, it is inferred that it was on the 25th or 26th of December.

MATINS, from *Matines*, Fr. the first part of the daily service in the Romish church; morning worship.

VESPERS, from *Vesperus*, Lat. in the Romish church, that part of the office which is recited in the afternoon, answering to our evening prayers.

VIGIL, from *Vigilia*, Lat. "a watching," the Eve of the day before any feast. Though the civil day begins at midnight, yet the ecclesiastical or scriptural day begins at six o'clock in the evening, and continues till six o'clock in the evening of the next day. Hence the first part of the holy day, from six o'clock the day before, was, by the primitive Christians, spent in singing and other devotion; and being often continued till late in the night, was called vigil; these vigils, or watchings, were at length so enlarged, that at last the day preceding the holy day was called by that name.

SEPTUAGESIMA, the *seventieth*, as Sexagesima, Quinquagesima, and Quadragesima, imply respectively the *sixtieth*, *fiftieth*, and *fortieth* day before Easter. *Quadragesima Sunday* is the first Sunday in Lent, the three Sundays preceding are called by names significant of their situation; and reckoning by *decades*, (tenths) instead of weeks, for the sake of even numbers, the Sunday preceding Quadragesima is called *Quinquagesima*, the second *Sexigesima*, and the third *Septuagesima.* These appellations were first used towards the close of the fifth, or beginning of the sixth century. The occurrence of these days depends, of course, wholly upon the occurrence of Easter.

MONTH, is a word of Anglo-Saxon origin, implying the period in which the moon completes her course round the earth. Months are also the names applied to twelve portions of the year called calendar months, because they are divided into a certain number of days each in the calendar, namely, *January*, *March*, *May*, *July*, *August*, *October*, and *December*, into thirty-one days each; *April*, *June*, *September*, and *November*, into thirty days each; and *February*, in ordinary years into twenty-eight days; every fourth year, or leap year, into twenty-nine days. A month sometimes means simply four weeks, or twenty-eight days.

Almost all nations have regulated their months in a great measure by the revolution of the moon. Some have endeavoured to unite this division with the annual course of the sun, by an augmentation of days at the end of each year, or by adding a thirteenth month at the end of every third year. The Jews and the Athenians followed this latter method. The Macedonians and some other nations of Asia

assigned to their months thirty and thirty-one days. The Turks and the Arabs have twenty-nine and thirty days. The months of the Anglo-Saxons were governed by the revolutions of the moon; their common year consisting of twelve lunar months; but every third year contained an additional month. They were named chiefly from the natural appearances of the year.

JANUARY, the first month of the year among the western nations, is from *Januarius*, Lat. a term given to it from *Janus*, one of the Roman divinities; or rather perhaps from *Janua*, Lat. "a gate," the first month being, as it were, the gate of the year. Numa Pompilius made *January*, Romulus *March*, the first month in the year.

January is, in England, generally the coldest month; the 14th, St. Hilary's Day, is said to be, on an average, the coldest of the year. Although at this season little can be done in the garden or the field, yet January is not without its natural phenomena of various kinds. Sometimes frost, intense frost, will excite our attention, and sometimes the keen winds and the drifting snow. At such times the feathered race become more immediately dependent on man; and, even at this inclement season, if a gleam of sunshine should appear, the thrush, as well as redbreast, will occasionally salute us with an evening song; nor are the hedge-sparrow and the wren silent.

In defiance of cold, some of our native plants blossom, though they rarely, at this season, perfect their seeds; such are groundsel, chickweed, the red dead nettle, and the furze; of this last it may be remarked that it is rarely, if ever, without blossoms. Sometimes, towards the end of the month, the snow-drop may be seen rearing its humble head in warm borders.

Winter is the sabbath of the vegetable world; the farmer mends his hedges, and draws on his manure; the gardener trains his trees.

FEBRUARY, (from *Februarius*, Lat. this is most probably from *februare*, "to purify," hence *Februarius*, is Purification month,) the second month of the year. In this month the Romans held a feast of twelve days' atonement on behalf of the manes of the deceased; in which also, *Macrobius* tells us, sacrifices were performed, and the last offices paid to the defunct.

February is truly a winter month; although in it are seen many indications of the approach of spring. The buds on the elder, the gooseberry, and the current swell, and sometimes burst; the hazel puts forth its long blossoms; and the crocus, the snow-drop, the polyanthus, the hepatica enliven the garden; and sometimes, in sheltered situations, and on banks, the primrose, the violet, and the cowslip may be seen. The daisy is also often in blossom in this month.

The farmer now begins his work. He ploughs up his fallows; sows spring wheat and rye; plants beans, pease; repairs hedges; drains land; in open weather plants trees of all kinds.

Gardens now require attention; and in warm borders many seeds for an early crop may be sown.

Birds are now becoming more actively in song; the redbreast, wren, and thrush, are, however, still most conspicuous.

MARCH is the third month of the year; it was named by Romulus after his supposed father *Mars;* he also appointed it the first month of the year; some of the ancients, however considered it, as we do, the third; others, the fourth, fifth, or even tenth month of the year.

About the 21st of this month, the sun enters the zodiacal sign of *Aries*, or the ram, which constitutes the vernal equinox.

The month of March is usually dry, windy, and cold. The rains of February having well moistened the land, this month is usually employed by the agriculturist and the gardener in committing many seeds to the earth. The activity of both is of course much excited. Grafting of plums is usually performed in this month.

The birds are becoming more harmonious; the fieldfares, woodcocks, &c. retire to their summer haunts, the northern regions, to perform the important offices of incubation, and rearing their young; while the willow-wren, and some of our other summer visitants come to us from the south. The rooks are busy with their nests. The wild pigeons coo in the woods.

The mezereon, with its lilac flowers, the jonquil, the wall-flower, the anemone, the crown imperial, the pansy, or love in idleness, and the narcissus are now in bloom. Daffodils, violets, and primroses are in their glory. Apricot and peach blossoms exhibit also their beauties on the garden walls; and in shrubberies, the almond.

APRIL, from the latin, *Aprilis*, from *aperio*, "to open," the fourth month of the year, because the buds now expand into leaves; the suddenness with which most trees and shrubs become covered with foliage, affords at once pleasure and surprise. April is, however, a fickle and changeable month; its day has been called by the poets "many-weathered;" consisting often of sunshine, storm, rain, and sometimes snow.

This month, is much occupied in sowing various seeds, both in the field, and in gardens. Grafting of the apple and pear is also now performed; the time of doing this depends, however, upon the progress which vegetation has made: the pear earlier, in general, than the apple.

Towards the end of the month, many of the summer birds of passage salute us with their songs; such are, the cuckoo, the nightingale, the black cap, &c. The swallow and the martin are also seen skimming over our fields, and around our dwellings. Many birds are now busy in the work of nidification.

Of flowers, both in fields and in gardens, the numbers are increased; the lilac begins to put forth its fragrance; the woodbine, the wall-flower, the cowslip, &c. are also, towards the end of the month, bright, beautiful, and odoriferous; the cuckoo-flower too peeps up in moist meadows; and the daisy and the harebell add to the variety of the scene. Auriculas and polyanthuses are now in fine bloom. The plum, and the cherry, and the pear are also now in bloom; and, towards the end of the month, the apple flings its fragrance to the breeze.

MAY, the fifth month of the year, is perhaps the most delightful of the twelve; it was named *Maius* by Romulus, from, most probably *Maia*, the mother of Mercury. In this month the trees assume their complete vesture of green; in fields the butter cups, the broom in wastes, diversify the verdure. The young corn is now shooting, and inspires the farmer with high hopes of an abundant crop. The gardens are also full of promise.

The fragrant blossoms of the hawthorn wave on the hedges to the gentle breeze; the horse-chestnut yields its rich and hyacinthine flowers; while many of humbler growth adorn the banks, the fields, and

our gardens: of tulips an infinite variety; the ranunculus; the piony; the lily of the valley: the orchis, and the campion, or ragged robin, add, the first, to the beauty of the meadow, the last, to the splendour of our banks and hedges. In the beginning of the month the laburnum, the lilac, and the apple blossoms are in their greatest glory.

In this month bees sometimes swarm. In this month too, the glow-worm may be seen with her phosphoric light, upon dry and warm banks. The cuckoo's and the nightingale's notes are now often heard; and the songs of birds generally are now full, various, and exciting; a May morning in a wood is ever a delicious treat; many birds are now busy in their works of nidification.

JUNE, the sixth month of the year, (called by the Romans *Junius*,) is of uncertain derivation. On the twenty-first of this month,

"Cancer reddens with the solar blaze;" THOMSON.

and makes the summer solstice.

This month offers to him who is fond of the country,—and who with unadulterated taste is not?—several agreeable sources of pleasure; the air is always bland, generally even hot; and the agricultural operations of *hay-making* and *sheep-shearing* excite, in a sort of festal activity, at once to pleasure, to business, and enjoyment. *Fragrance*, in the country may be an appropriate term for this month; whether it be exhaled from the variegated flowers of the meadow, the fields of clover, of beans, or of hay; or whether from the garden with the rose, the jessamine, the sweet-william, the sweet pea, and the woodbine; add to these, not indeed of much fragrance, but of various and numerous dyes, the larkspur, the candy-tuft, nasturtiums, poppies, Canterbury bells, the lychnis, and lilies of many kinds. The pink, carnation, and stocks, of infinite hues, embellish the borders of him who is disposed to become a nurse for these beautiful children of nature; and impart also their varieties of odour along with the flower de luce, one species of which with extreme delicacy of scent, should never in a garden be omitted.

Towards the end of this month, many of the singing birds cease their notes; the nightingale in particular is scarcely, if ever, heard after the 30th; nor is the cuckoo often, though occasionally, later in song. Migratory and other birds are now busy in the work of incubation.

Some fruits are now ripe, among which the cherry and the strawberry are the chief.

JULY is the seventh month, from *Julius*, Lat., said to be derived from Julius Cæsar, who was born in this month; Mark Antony first gave the name *Julius* to it; it was called before *Quintilis*, from being the fifth month, according to the old Roman calendar; for the same reason August was called *Sextilis* or the sixth.

Abundant objects will now excite our pleasure, in our walks through the numerous and variegated fields of nature; whether it be over the lately close shorn meadow, the promising and ripening corn field, or the uplands and lofty hills, where the heath sheds a purple tint over the swelling undulations; the furze and the broom still with their beautiful yellow blossoms; and the whortleberry modestly hanging

beneath its olive green leaves; or in the shady wood secluded from the now intense rays of the powerful sun.

The fruits of the garden, gooseberries, currants, raspberries, cherries, are now fully ripe; the lilies of many kinds are now in their splendour; the holly hock, the convolvulus, the sunflower, and innumerable cultivated plants, offer their fragrance, or their colours to our senses. The bindweed, with companulate flowers of snowy white, adorns every hedge; the scarlet poppy the waving corn. Of flowering shrubs, the Spanish broom and syringa may be named.

Of the numerous culinary vegetables now scattered before us in profusion, we cannot speak; they offer a rich variety for every taste.

AUGUST, the eighth month, from *Augustus*, Lat.: the term implies majestic or grand, and was first given to Octavius the Roman emperor, he being named Augustus Cæsar in consequence of his victories. This month was therefore dedicated to his honour, and still goes by his name. See July.

This is the harvest month in this and most other temperate European countries. The harvest, chiefly, it should be observed, the wheat harvest, used almost universally to be finished by a feast called *harvest-home*, when for a few hours the master and the servant was forgotten, and both mingled in social companionship: modern manners have, however, a good deal contracted such intercourse; and although harvest home be not quite abolished in our agricultural districts, we fear it is greatly on the wane.

Many fruits, among which may be named the apricot, are now fully ripe; plums, peaches, and nectarines may now also be obtained. Of flowers and flowering shrubs, natives of foreign climes, many may be now seen of great beauty; such are African marygolds, China asters, persicarias, chrysanthemums, dahlias; the clematis, or virgin's bower, adorns the cottage porch. Geraniums and hydrangeas are now also in their greatest glory; so also is the passion flower.

Our song-birds, the thrush, the lark, and red-breast chiefly excepted, are for the most part silent during this month; some of the migratory birds assemble in flocks previously to their departure.

SEPTEMBER, (from *Septem ab imbre*, the *seventh* month after rain or snow, reckoning from March,) the ninth month; on the 22d of September the sun enters Libra, and makes the autumnal equinox.

September, notwithstanding occasional cold nights and mornings, has been aptly called "bland September"; it has neither the excessive heat of July, nor the cold of the later autumnal months. In the southern parts of Great Britain, the corn harvest is generally cempleted by the beginning of this month. In Scotland, and the border-counties, seed is generally sown much later in the spring, and consequently the grain is sometimes not gathered into barns till warning snow proclaims, No more delay. The corn is no sooner gathered than the husbandman proceeds, by ploughing, to prepare the land again for corn.

The vintage, or cider-making of this country, usually begins in this month, although it is very remarkable that little good cider is ever made before the month of October; fruits that ripen early not usually yielding cider of much strength.

Herrings appear this month off the coasts of Scotland.

The summer birds of passage are now departed or departing; winter birds, on the contrary, sooner or later in this month, are the next

to appear. Except the thrush, the red-breast, and the lark, few birds are now in song.

Our gardens yet afford many varieties of fruits besides apples and pears; such as peaches, nectarines, and plums; flowers are becoming scarcer, but China asters, chrysanthemums, and Michaelmas daisies still abound. The dahlia is now in its greatest beauty. Although forest trees do not yet shed their leaves, they nevertheless put on the various hues of autumn.

During this month beans, barley, and clover for seed are usually harvested. The oak sheds its acorns in this and the next month, and the beech its mast.

OCTOBER, (from *Octo ab imbre*, the *eighth* month from snow or rain, see SEPTEMBER), is the tenth month of the year, the same as it was of Numa, Julius Cæsar, &c. Notwithstanding the names of *Faustinas*, *Invictis*, and *Domitianus*, which the senate and emperors would have given to this month, it has still retained the name of October.

Although the trees scarcely begin to shed their leaves, their rapidly changing colours demonstrate that their falling is at hand. Yet a walk into the country still affords pleasure; the blackberries hang in ripening clusters; and the hips and haws look ready for the birds' winter repast. The birds are almost silent, save the thrush or the red-breast; the rooks with their cawing, hoarse and monotonous as they are, retire in numerous flocks to their distant repose, or wheel in airy circles around their dwellings of the spring.

The rough winds scatter the sere and yellow leaf, and the moanings of the gust proclaim that winter is near. Of flowers the catalogue is become scanty; the ivy now is beginning to rejoice in its dark green, conspicuous around many a tree, and the shelter to numbers of the feathered tribe.

This month is occupied in various agricultural and horticultural labours; land is ploughed, and corn is sown; fruit, forest, and evergreen trees and shrubs are now planted. Cider is made, and the new corn threshed out.

NOVEMBER (from *Novem ab imbre*, the *ninth* month from winter showers) is the eleventh month of the year.

The most singular characteristic of November is the fall of the leaves: the chestnut, the sycamore, the lime, and the ash, first part with their ornamental yet perishable vestments; the elm next; the beech and the oak yield last to the shower or the wind.

The strawberry tree, *arbutus unedo*, a native of Ireland, and a pretty evergreen, now presents us with fruit and blossom.

Larks, goldfinches, and other birds now congregate; their songs for the present year are no more, except indeed that of the solitary red-breast, or the almost ever-singing thrush, *turdus musicus*.

The husbandman still continues, in open weather, to sow his corn; with turnips feeds his folded sheep, and the gardener now protects his plants, in various ways, from the inclemencies of the winter.

The evenings are now long, and he who is not called abroad by necessary occupation may find various ways of engaging himself in some useful and in-door pursuit; so that no time ought now, from the sources of knowledge open to us, by books and otherwise, to be wasted—none to be unemployed.

DECEMBER (from *Decem ab imbre*, the *tenth* month after the

rains) the twelfth and last month of the year; on the 21st of which the sun enters Capricorn, and makes the winter solstice.

There is a sameness about this and the preceding month, which requires little observation: for, as soon as the leaves have quitted the trees, nature appears to assume, for some time, a sort of "universal blank," except that those trees usually called evergreens appear at such time uncommonly agreeable and refreshing. Of these, one of the most singular is that parasitic plant the *misseltoe*, much in request at Christmas. The origin of its use as an ornamental decoration, at such time, is said to be derived from the ancient Druids; the holly and laurel appear in the winter in their brightest hue; there is, however, one evergreen tree remarkable for blossoming a long while in the autumnal months, and even during the winter, and that is the laurustinus.

We may mention here, that the latest accounts concerning the natural history of the cricket, *gryllus domesticus*, inform us, that this animal passes the hottest part of the summer concealed in the crevices of walls and heaps of rubbish, and that, in quitting its summer abode, it takes up its residence in or near the warm hearth of the cottage where its chirping is so well known.

We have thus brought our young friends to the end of the year; if in passing through its various seasons we have contributed to their pleasure or amusement, we have not written in vain; and while we remind them never to forget that we are all "passing away" like the year; yet, as Christmas is a time of festivity, we are therefore disposed to be hilarious, and say with Sir WALTER SCOTT,

> "Heap on more wood, the wind is chill;
> But let it whistle as it will,
> We'll keep our merry Christmas still."

DAYS. The English names of the days of the WEEK are derived from the Saxons; and it is said they partly adopted their names from the civilized nations of antiquity. The Germans worshipped the *Sun* with such devotion that they dedicated to it the first day of the week, calling it *Sunday; Monday*, the Moon's day, from *mona* and *day; Tiw*, the same with *Mars, Tuesday;* they also worshipped *Woden*, (*Godan*,) whence was *Wednesday.* It is said, *Godan* becoming afterward contracted into God, the Saxons gave this name to the Deity. They also worshipped the god *Faranes*, the same with the Danish *Thor*, the Thunderer, *Jupiter*, whence *Thursday.* The goddess *Friga*, *Freya*, or *Venus* gave name to *Friday.* *Saturday* is from *Seater*, to whom they prayed for protection, &c. The Romans, from the sound of this name, took this idol to be the same as their Saturn.

We add the *Latin*, *English*, and *Saxon* names of the days of the week.

Latin.	*English.*		*Saxon.*
Dies Solis,	Day of the Sun,	Sunday,	Sun's Day.
Dies Lunæ,	Day of the Moon,	Monday,	Moon's Day.
Dies Martis,	Day of Mars,	Tuesday,	Tiw's Day.
Dies Mercurii,	Day of Mercury,	Wednesday,	Woden's Day.
Dies Jovis,	Day of Jove,	Thursday,	Thor's Day.
Dies Veneris,	Day of Venus,	Friday,	Freya's Day.
Dies Saturni,	Day of Saturn,	Saturday,	Seterne's Day.

Weights and Measures.

Our limits will not permit our giving many useful tables concerning WEIGHTS and MEASURES with which it is necessary that most persons should become acquainted; such can of course be obtained from the ordinary books which treat in detail of those things; but as an Act of Parliament was passed in 1824, which materially altered some of the measures then in use in this country, a succinct account of the alterations shall be here given.

By this Act it is enacted that the old standard yard of 1760, in the custody of the clerk of the House of Commons, shall continue to be the standard unit of extension, or lineal, superficial and solid measures, when the temperature is at 62° of Fahrenheit's thermometer. No change, therefore, takes place in such measures throughout the empire, except in Scotland, where considerable changes, especially in the measurement of land, must take place. But it is enacted, that if the yard above referred to should be lost or injured, it is to be restored by a reference to a pendulum, vibrating seconds in the latitude of London, at the level of the sea, and in *vacuo*. This length has been found and is declared by the act to be 39.1393 inches; hence the length of the yard to that of the pendulum is in the proportion of thirty-six inches to 39.1393.

It is also enacted, that the old Troy pound of 1758, now in custody of the clerk aforesaid, shall continue to be the standard unit of weight; and that the Avoirdupois pound now in use shall contain 7000 grains, of which the Troy pound contains, according to this Act, 5760 grains. Hence no change will take place in transactions of business, when such weights have been heretofore used; but in Scotland numerous changes of weights must occur in the sale of many articles of ordinary consumption. If the Troy pound should be lost or destroyed, it is to be restored by reference to the weight of a cubic inch of distilled water, which is declared to be 252.458 Troy grains, at the temperature of 62° of Fahrenheit, the barometer being at 30 inches.

In regard to Measures of Capacity for all liquids, and for dry goods not measured by heaping, it is enacted that the new standard measure shall be a *gallon* containing ten pounds weight of distilled water, weighed in air at the temperature of 62° of Fahrenheit's thermometer, the barometer being at 30 inches; that the *quart* shall be a fourth of such gallon, the *pint* one eighth; that two such gallons shall be a *peck*, and eight shall be a *bushel;* that eight such bushels shall be a *quarter* of corn or other dry goods, not measured by heap measure.

These changes in measures of capacity are very great; by them the *old standard wine gallon* of 231 cubic inches, the *ale and beer gallon* of 282 cubic inches, the *old standard corn gallon* of 268.8 cubic inches, the *Winchester bushel* of 2150.42 cubic inches, the *old standard Scots pint* or *sterling jug* of 103.404 cubic inches, the old Scots standard wheat and barley *Firlots*, with all other local measures of every description, are abolished.

In regard to Heaped Measure, it is enacted that the standard shall be the *bushel* containing eight *imperial* gallons, (so the new gallon is called,) or eighty avoirdupois pounds of water at the abovementioned temperature; and that it shall be made round with a plain and even bottom, and be 19 1-2 inches from outside to outside (*in*

diameter we presume). In using this bushel it is to be heaped in form of a cone to the height of six inches, and the outside of the bushel is to be the extremity of the base of the cone. In the clause appended to the bill it is ordered that all such measures shall be made cylindrical, and that their diameter shall be at least double their depths, and the height of the cone shall be equal to 3-4 of the depth of each measure.

The proportion of the *imperial gallon* to the wine gallon is as 6 to 5 nearly; to the *ale gallon* as 59 to 60 nearly; and to the *corn gallon* as 33 to 32 nearly; its proportion to the stirling pint is as 59 to 22 nearly.

We add the *names* and *weights* of the *imperial, liquid, and dry measures.*

Measures.		Pounds Avoirdupois of Water.
5 oz. Avoirdupois of water	= 1 gill	5-16
4 gills	= 1 pint	1 1-4
2 pints	= 1 quart	2 ½
4 quarts	= 1 gallon	10
2 gallons	= 1 peck	20
4 pecks or 8 gallons . . .	= 1 bushel	80
8 bushels	= 1 quarter	640

END OF THE FOURTH PART.

CONCLUSION.

THESE are the STEPS of KNOWLEDGE; YE are come
Within the precincts of her TEMPLE; look
Around the goodly fane of lofty front,
Of fairest promise; lo! its numerous aisles
In structure varied, as for varied *Use*,
For *Pleasure* and for *Beauty*. Whoso here
Worships shall never find his vows unheard;
Nor shall the *Goddess* of benignant grace,
If here YE enter with befitting mind,—
With *Perseverance*—purified Desires—
With Candour—Modesty in search of *Truth*,
And of *Utility*, handmaiden fair—
Refuse to strew upon the ample floor,
Her fragrant flowers—choice gifts—her sure rewards.

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